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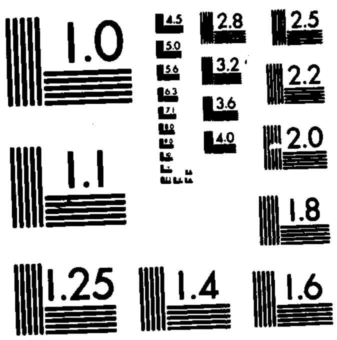

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FACTORS INFLUENCING ARMY ACCESSIONS

THESIS

AFIT/GOR/OS/82D-7

Kenneth Kalinich
Captain USA

Dennis Wenzel
Captain USA

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY (ATC)

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Factors influencing Army accessions were studied using the Army Research Institute's (ARI) Military Entrance Processing Station (MEPS) data base, a US Army Recruiting Command (USAREC) data base, and a Defense Manpower Data Center (DMDC) data base. Six types of analysis were performed: regression analysis, data base profile analysis through SPSS Frequencies and Crosstabs, factor analysis, discriminant analysis, time series analysis, and analysis

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of leading economic indicators. The USAREC Enlistment Prediction Model was improved; the MEPS file was reorganized, analyzed with respect to District Recruiting Command (DRC), and merged with the USAREC file; factor and discriminant analysis procedures were developed and employed to examine the merged file by DRC; Box-Jenkins time series analysis was applied to the DMDC data; and procedures were implemented using leading economic indicators. Computer programs were written by the authors to accomplish the foregoing analyses. Procedures developed in the study should aid USAREC and ARI researchers and managers to better understand the variables influencing recruiting, and enhance their ability to effectively allocate scarce resources by Region and DRC. Ultimately, the information derived from these analyses could aid ARI and USAREC planners in their formulation of recruiting policy.

AFIT/GOR/OS/82D-7

FACTORS INFLUENCING ARMY ACCESSIONS

THESIS

Presented to the Faculty of the School of Engineering

of the Air Force Institute of Technology

Air University

in Partial Fulfillment of the

Requirements for the Degree of

Master of Science

by

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Graduate Operations Research

December 1982

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Acknowledgements

The analysis presented in this report represents our attempt to help the Army study the topic of accessions. Hopefully, we have provided Army manpower managers some useful techniques to aid further study. Throughout this paper we assume the reader has a basic knowledge and understanding of standard methods of statistical analysis.

We wish to express our deepest gratitude to Dr. Ivy Cook for providing his aid and assistance in seeing us through this effort, and to Dr. Richard Kulp for reviewing this report and offering valuable insights. We would like to thank Dr. Neil Dumas, Mr. Ed Schmitz, and Dr. Abe Nelson from the Army Research Institute for providing the MEPS data file and advice on how to manipulate the file. Our thanks is also extended to Major John Wallace, Dr. Marv Trautwien, and Mr. Gerald Klopp from the US Army Recruiting Command for providing us the Enlistment Projection Model and its associated data base plus a great deal of food for thought. A special thanks goes to Captain Phil Knorr who delayed going on leave and enjoying the beautiful California coastline until he provided the monthly accession data we requested. Finally, we are deeply indebted to Yong Sun Wenzel for the many hours of typing and clerical support she provided.

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Abstract

Factors influencing Army accessions were studied using the Army Research Institute's (ARI) Military Entrance Processing Station (MEPS) data base, a US Army Recruiting Command (USAREC) data base, and a Defense Manpower Data Center (DMDC) data base. Six types of analysis were performed: regression analysis, data base profile analysis through SPSS Frequencies and Crosstabs, factor analysis, discriminant analysis, time series analysis, and analysis of leading economic indicators. The USAREC Enlistment Prediction Model was improved; the MEPS file was reorganized, analyzed with respect to District Recruiting Command (DRC), and merged with the USAREC file; factor and discriminant analysis procedures were developed and employed to examine the merged file by DRC; Box-Jenkins time series analysis was applied to the DMDC data; and procedures were implemented using leading economic indicators. Computer programs were written by the authors to accomplish the foregoing analyses. Procedures developed in the study should aid USAREC and ARI researchers and managers to better understand the variables influencing recruiting, and enhance their ability to effectively allocate scarce resources by Region and DRC. Ultimately, the information derived from these analyses could aid ARI and USAREC planners in their formulation of recruiting policy.

FACTORS INFLUENCING ARMY ACCESSIONS

I. Introduction

The subject of this thesis is accessions and the factors influencing a potential recruit's decision to join the Army. The topic of accessions has been a great concern for Army planners since the birth of the All-Volunteer Force. Currently the United States Army Recruiting Command (USAREC) is experiencing a "boom" in recruitments, which can be attributed to the zealous efforts of USAREC recruiters and to the current economic conditions. However, once the economic situation reverses, there will be more pressure put on the internal system to meet enlistment quotas. Whether operating in "boom" or "bust" years, Army planners must be able to effectively allocate both dollars and manpower within USAREC, and the Army as a whole, to make the most productive use of these limited resources.

This thesis is organized in the following manner:

Chapter II	Presents general background information on the topic of accessions. Additionally, it discusses current related research that influenced this study, and highlights the importance of this effort.
Chapter III	Discusses the methodology employed in Chapters IV, V, VI, and VII.
Chapter IV	Presents regression analysis performed on the USAREC data base.

Chapter V	Discusses the Military Entrance Processing Station (MEPS) applicant file and the key problems encountered in analyzing this MEPS file. Also included is a discussion of the merging of key elements in the USAREC data base with the MEPS file.
Chapter VI	Presents discriminant and factor analysis performed on the merged file. The factor analysis section demonstrates a technique for analyzing the critical factors affecting recruiting at the regional and the DRC level. Next, procedures are developed for performing discriminant analysis on the merged MEPS and USAREC data to determine the key variables that influence personnel to join the Army over the other services.
Chapter VII	Presents time series analysis performed on nationwide accession rates. It presents the development of three leading indicator models for accession rates.
Chapter VIII	Highlights the major accomplishments of this thesis and discusses the results and conclusions from the analytic chapters.

II. BACKGROUND

General Topic

The debate over the All-Volunteer Force (AVF) encouraged the creation of a presidential commission, named the Gates Commission, which was tasked with developing a comprehensive plan for eliminating the draft and moving toward an all volunteer armed force. In 1970 the Gates Commission delivered its final report to the President and to Congress with the recommendation that first-term military pay be raised to a level that could compete with current levels of pay received by 18 to 21 year old male high school graduates. This would allow the Armed Forces to attract enough qualified volunteers without the need for the draft (Ref 4).

The movement away from the draft toward the AVF was partially due to the increasing resistance to the Vietnam War, but was also due to a natural evolution that was dictated by the economic forces of the human resource market. Increasing numbers of men were reaching draft eligible age each year, while the "winding down" of the war moved the Armed Services toward decreasing their force size. These coincident factors operating together meant that a smaller percentage of the eligible population would actually serve in the Armed Forces. Based on these conditions and the Gates Commission recommendations, Congress raised first-term pay in 1971, which coincided with plans for termination of the draft by 1973. Secretary of Defense Melvin Laird in fact ended draft calls in January 1973, six months prior to the expiration of

the draft authority. The nation thus became committed to the AVF, and all new recruits were strictly volunteers.

Initial reports to Congress (Ref 5:5928) indicated that the services had been able to successfully recruit a socially representative mix of qualified personnel to meet defense requirements. Despite the rosy picture painted to Congress, the Army experienced recruiting shortfalls: failing to meet requirements for gross number of enlistments, failing to attract and enlist sufficient numbers of recruits into the combat arms specialties, and failing to recruit enough "higher category" personnel to fill the Army's increasing number of technical positions (Ref 4).

Manning the Force became one of the key issues faced by the Chief of Staff of the Army. This was evidenced by the intensification and expansion of resources, both in dollars and in manpower, allocated to the U.S. Army Recruiting Command (USAREC). Greater and greater pressures were placed on recruiters to meet their mission requirements in the face of continued shortfalls, so much so that grievous violations of recruitment standards occurred leading to the conviction and imprisonment of several recruiting personnel including officers. Today, only officers who are in the top third of their year group are selected for assignment to USAREC and the enlisted recruiters are only chosen after a very extensive screening process. Despite the increased emphasis, advertising, dollars, and manpower, USAREC continued to experience shortfalls until the economic downturn. An

important, intuitively obvious factor that influenced enlistment rates is the condition of the marketplace.

Current Related Research

The topic of accessions is of critical importance to Army planners. Thus there are a myriad of studies in this field. An entire thesis could be directed to a literature review. However, since this thesis is an application effort, the main concern is that no current research is being duplicated. With this in mind, the Deputy Chief of Staff for Personnel's analysis shop, The Army Research Institute (ARI) and the United States Army Recruiting Command (USAREC) were contacted with this proposed study topic (accessions). There are many ongoing studies of which a few are discussed below and both ARI and USAREC enlisted our services in studying accessions.

Several models have been developed which show the relationships between recruiting variables and mission accomplishment (actual accession of personnel into military service). USAREC uses an automated predictive model along with professional judgement and institutional memory in the allocation of resources and mission requirements among its five Region Recruiting Commands (RRC's) and its 57 District Recruiting Commands (DRC's). This model, the Enlistment Prediction Model (EPM), and regression analysis are used to produce the various missions that are assigned to the RRC's. Next, market recruitment potentials are converted to percentages of the command and specific regional missions are

assigned to the DRC's. Program Analysis and Evaluation (PA&E) Directorate personnel use professional judgement to refine the mission which is further adjusted after negotiation between the USAREC Commander and the DRC Commanders. Current research on the relationships between the various variables and the recruiting mission has not yet provided adequate models for the allocation of recruiters, advertising dollars, recruiter aides, etc., in determining where these resources can be most productive.

Two recruiting resource allocation models have been developed by USAREC: the EPM, discussed above, and the Veteran's Educational Assistance Program (VEAP) Incentives Model. The VEAP Model uses unemployment rates and number of active recruiters in the system as two of its four explanatory variables. There is only limited data on VEAP contracts (only that available since the end of the G.I. Bill), so that simultaneous equations are used to base predictions on term of enlistment and the number of accessions. Once more data becomes available, a regression model will be developed with the basic VEAP Model.

Two recruiting resource allocation models have been developed by contract: the Claritas Geodemographic Model, and the N.W. Ayer Advertising Effectiveness Model (Ayer Model).

The Claritas model uses over 500 demographic variables that are combined into 34 factors. These factors, combined with measures of recruiter strength, proportion of

population serving in the Armed Forces, are used in a linear regression model to predict the annual recruit penetration into the population of available males by mental category. The Claritas model was done under contract for the Army, so that the specifics of the model are known only to the contractor. Claritas uses r squared as a measure of effectiveness in order to determine where the Army should concentrate its recruiting efforts in order to maximize accessions.

Another study sponsored by USAREC, was the evaluation of the effectiveness of the Army's National Advertising Expenditures (the Ayer Model). The object of the modelling project was to measure the impact of dollars spent for recruiting on the quantity and quality of recruits. A secondary objective was to measure and compare the influences of other major factors such as pay, size of the recruiting force, type and extent of recruiting mission, and the amount of money spent on advertising in order to determine the most cost effective way of increasing the quality of accessions. The model assumed that any omitted variables were not dominating influences and that past (1976-1980) relationships will persist, staying relatively close to their observed ranges. The main findings of this study were that dollars spent on advertising were the most cost effective way of increasing the quantity and quality of accessions. It should be noted that N.W. Ayer International is the advertising agency that handles a majority of the Army advertising.

The Optimal Recruiter Allocation Model (ORAM) was developed to show the relationship between the many dependent variables and the District Recruiting Command's mission (Ref 23). Its findings suggest that the optimal allocation of recruiters would move recruiters from the Northern and Western Regions and place them into the two southern regions. This seems to tie in with the 1980 census data which indicated population shifts into the "Sun Belt", and with the traditional conservatism associated with the South and its support of the military. ORAM uses past performance to allocate recruiters to areas where recruiting has been successful.

Two models developed for the Navy are Morey's Budget Allocation and Enlistment Prediction Model, and Goldberg's Navy Enlisted Supply Study. All of the models discussed above are summarized in Ref 16.

Dale and Gilroy (Ref 5) present an application of time series analysis used to predict accession rates. This was a working paper which the authors permitted us to use as a source in this thesis. An objective of the paper was to study the relationship between economic variables and accession rates. Unemployment rates were one of the key independent variables in this study and the dependent variable was male high school graduate mental category I-IIIA accessions. Regression analysis was used lagging unemployment rates to determine the correlation between accessions and the lagged unemployment rates.

The Dale and Gilroy study was important to this thesis effort because it is a current working project and it studied one of the variables important to this effort, unemployment rates.

Problem Statement and Research Objectives

The thrust of this thesis is identified as follows:

1. Study accessions in an attempt to understand what factors influence them.

2. Build a discriminant function to predict whether a potential accession will join the Army or other services.

3. Enhance the USAREC Enlistment Prediction Model.

4. Conduct time series analysis on accessions using Box and Jenkins techniques.

5. Developed leading indicator models to predict accessions based on the following input variables: unemployment rates, the producer price index and the prime rate.

6. Provide to ARI and USAREC usable computer programs to accomplish the above.

III. METHODOLOGY

Introduction

This chapter presents the methodology employed in the following four chapters.

The Data

Initially this study started as an analysis of a ten percent random sample of the Military Entrance Processing Station (MEPS) Applicants file which was received from the Army Research Institute (ARI). This file consists of up to 256 variables of information about individuals who show an interest in the armed services. This interest is manifested by the applicant arriving at a MEPS to begin enlistment processing. Approximately 58.18 percent of the applicants turn into accessions. There are 48,520 applicants or cases in the file, so that, in order to facilitate some form of a cost effective analysis, the number of variables per case was reduced to what was considered a manageable and minimum number of essential variables. These included such variables as date of birth, sex, service processed for, etc.

Additionally, the United States Army Recruiting Command (USAREC) was visited and another data base was obtained, which will be referred to as the USAREC file. The USAREC file is input into an SPSS regression routine to predict various levels of accessions. This model is the initial phase in the quarterly process of assigning the recruiting mission to the fifty-seven District Recruiting Commands (DRC's).

The focal point of this phase of the analysis was to enhance the USAREC regression model. This is discussed in Chapter IV.

There were many variables in the USAREC file that could be applied to individuals on the MEPS Applicant File. For instance, the USAREC file lists the unemployment rate for the specific DRC's for specific quarters. This is an important variable because it reflects the unemployment rate that was influencing the applicant to make contact with a recruiter. The problem became to merge desired variables in the two files into a new file. This process is discussed in detail in Chapter V. The major stumbling block in this step was the fact that the variables in the USAREC file relate to DRC's, whereas the variables in the ARI file relate to individuals, and the individual MEPS records are not categorized by DRC. The task became to equate an individual MEPS record to a DRC. Once this task was accomplished, meaningful analysis was performed on the merged file using discriminant and factor analysis routines from SPSS. These results are discussed in Chapter VI.

Another objective of this study was to perform time series analysis on accession data. The USAREC file contained only 22 quarterly data points which is not an adequate amount to perform time series analysis. A third data set of monthly accession figures from October 1975 to July 1982 was obtained from the Defense Manpower Data Center (DMDC), US Army MILPERCEN Liaison Officer, Monterey, California. The 81 data points were utilized in the analysis performed in

Chapter VII. When modelling accessions using leading indicator techniques, the following variables were used as input variable:

Variable	Journal Source
National Unemployment Rates	Federal Reserve Bulletin
Producer Price Index	Monthly Labor Journal
Prime Rate	Monthly Labor Journal

There was a slight problem to be resolved when using these variables. From month to month the rate can change due to revised calculations. Therefore, the last time a rate or index appears in a journal is the rate used in the analysis. For example, in the September issue, for the first time, is listed the unemployment rate for August. However, the August rate will appear in several future editions and may be changed. In June of the following year the August rate will no longer be shown. Thus, this analysis used the rate from the May issue.

A sample of the USAREC file is shown in Appendix A-1. Complete listings of accessions, unemployment rates, the producer price index, and the prime rate are shown in Appendices A-2 through A-5.

Analysis Techniques

All analyses were performed on a Cyber CDC 6600 using SPSS for the regression, factor and discriminant analysis. Biomedical Computer Programs P-Series (BMDP) (Ref 24) was used along with FORTRAN time series computer programs (referred to as TSP) that utilize various International

Mathematical and Statistical Library (IMSL) subroutines.

Regression

It is felt that regression analysis is a common method of analysis, therefore, it is not expounded upon in this paper.

File Merge

The USAREC file and the MEPS applicant file were merged in order to perform multivariate data analysis. This process is discussed in detail in Chapter V. The merged file is referred to as MU for MEPS-USAREC.

Factor Analysis

Factor analysis was performed on the MU file using the SPSS subroutine Factor to discover how the various variables in the analysis "hang together" to form what are called factors or principal components. The SPSS method of factoring chosen was "Principal Component Analysis", i.e., TYPE=PA1. Factor analysis can be used to reduce the dimensionality of the data sample by condensing out principal components from the patterns and relationships found among the observed variables in the sampled data. This type of analysis is similar to using "cluster analysis" on a correlation matrix to pick out clusters of variables that have high correlation coefficients among each other, and calling the resulting cluster a "factor." The MU file was examined using factor analysis in order to add to the overall MU data profile and to enhance the cross-tabulation and discriminant analysis.

Thus, this study supports the thesis objective of giving ARI and USAREC a detailed overview of the important factors relative to recruitment. Chapter VI contains the results of the factor analysis performed on the MU file.

Discriminant Analysis

Discriminant analysis was performed on the MU file using the SPSS subroutine Discriminant to examine how well the different MU variables could predict that an individual would join the Army over another branch of the service, and to discover the differences among these predictive variables by region. The fundamental aim of discriminant analysis is to formulate a rule that can be used to correctly classify individual cases into two or more groups based on attribute variables associated with the given cases. In SPSS the rule that is formulated consists of assigning both standardized and unstandardized weights to the attribute variables that can then be used to predict into which group a randomly sampled case may fall. Under SPSS there are two ways to classify groups, given raw input data: either by using Fisher's Linear Discriminant Coefficients, or by using the Canonical Discriminant Function Coefficients. If Fisher's Coefficients are used, then the highest of the computed functional values will show what group the input case is to be classified. If the Canonical Coefficients are used, then for the case of two groups, one can classify the input case based on the sign of the resulting functional value since the overall population mean (population centroid) will have

a value of zero. In this study the Canonical Coefficients rather than Fisher's Coefficients are tabled in Appendices C-9 through C-12. When the unstandardize Canonical Coefficients are used, only one equation and set of coefficients is required to compute which group a random case belongs to. The result of such a computation on raw input data will be either positive showing it belongs to one group or negative showing it belongs to the other group. A zero result would point to neither group. The standardized weights show the intensity with which a particular variable is able to help predict into what group a case belongs. The unstandardized weights are coefficients which are very much like the coefficients in regression analysis that are used to compute a dependent variable; but in discriminant analysis the computed variable is compared to the group means to show where it falls relative to them, thus predicting to which group a case "belongs."

To develop and later test the discriminating equation, the MU file is randomly divided into two halves. The first half of the file is used to model the discriminating equation, then the first half is run against the formulated equation to see what percentage of the records are correctly classified by the equation. The second half of the file is likewise run against the same formulated equation to determine how well the equation correctly classifies a random data sample other than the random sample that created the equation.

The SPSS procedure includes a listing of both the standardized coefficients as well as the values of the group centroids, i.e., the values of the discriminant function evaluated at the group means. There are also five important statistical values generated by the discriminant subroutine:

1. Canonical Correlation,
2. Wilks Lambda,
3. Chi-Squared,
4. Degrees of Freedom, and
5. the corresponding Significance.

The last value is a percentage used in hypothesis testing such that if a test is conducted at alpha equal .05 and the resulting Significance is greater than .05 then the null hypothesis will be accepted. Specifically, in the case of discriminant analysis, the null hypothesis is that the group centroids are equal, i.e., there is no significant difference between the groups. However, if the Significance is less than .05 then the null hypothesis will be rejected. Specifically, it is concluded that the discriminant functions provide a significant differentiation among the groups. The Significance value in this study is a resulting measure of the following test of hypothesis:

$$H_0 : U_1 = U_2$$

$$H_1 : U_1 \neq U_2$$

where U_1 = the group centroid for non-Army records

and U_2 = the group centroid for Army records.

To test this hypothesis a chi-squared statistic is computed by SPSS and compared to the tabled value of chi-squared at a given alpha and with p*(g-1) degrees of freedom, where p is the number of parameters and g is the number of groups. If the computed chi-squared is greater than the table value of chi-squared, the null hypothesis will be rejected. If the null hypothesis is rejected, then it can be concluded that the discriminant functions do indeed provide a significant differentiation among the groups.

The discriminant coefficients, centroid values, and forementioned statistics are the primary tools used in this portion of the study to examine the MU file and to try to discover what variables, if any, had an impact on differentiating the Army from the non-Army prospective recruits.

The Mahalonobis distance stepwise method was employed in all discriminant analyses performed in this study. This method allowed only the most significant variables to enter in each individual analysis, thus permitting very refined differentiation by DRC. Since only the most important variables within each DRC were selected, a clearer definition of the demographic differences among DRC's can also be developed. The selection criteria for the entry of a given variable in the stepwise procedure depended on having a partial F ratio of greater than or equal to 1.0, while the tolerance level was set at .001 (Ref 20:448-454). Chapter VI contains the results of the discriminant analyses performed on the MU file.

Time Series Analysis

The goal of the time series analysis was to develop a model which predicts accessions based upon previous values of accessions. A FORTRAN program called TSP was written based upon Box-Jenkins (Ref 1) time series analysis techniques. This program uses IMSL subroutines to calculate autocovariances, autocorrelations and partial autocorrelations. These values are graphed and examined for significant values. Additionally, Gray, Kelley and McIntire's R and S array techniques for model identification (Ref 9) have been incorporated into this program listed in Appendix A-6. Once the model has tentatively been identified, BMDP time series routines are used to further analyze the model. Once a final model has been chosen, adequacy checks are conducted, using FORTRAN programs and BMDP. These checks included the Portmanteau lack of fit test and the cumulative periodogram plot (Ref 1:290-298) and analysis of the residual series for significant autocorrelations. This time series approach is applied in Chapter VII.

Leading Indicator Analysis. In modelling accessions using a leading indicator, the desired results are two-fold: first, determination of an input variable that leads accessions, in order to allow use of current values of the input variable to predict future values of accessions, and second, tightening of the standard error band about the predicted values of accessions. Once again BMDP leading indicator techniques were used. The steps in this modelling process are

as follows:

1. Model the input variable as an Autoregressive Integrated Moving Average Process (ARIMA) to obtain the prewhitened input series, say $R_x(t)$.

2. Apply the ARIMA model to accessions and denote the filtered output series as $R_y(t)$.

3. Cross correlate $R_x(t)$ and $R_y(t)$ attempting to identify the functional form of the transfer function component.

4. Identify an ARIMA model for $R_y(t)$ and cobine the ARIMA component with the transfer function component to obtain a tentative transfer function model.

5. Apply autocorrelation and cross correlation checks (Ref 1:392-298) to test for model adequacy.

6. Forecast future values of accessions.

All of these steps were performed using BMDP. This technique is applied in Chapter VII, using accessions as the output variable and unemployment rates, producer price index, and the prime rate as input variables.

Statistical Significance

In any study, results could appear that are attributable solely to chance or sampling variance. In order to minimize this possibility, tests described in this report are conducted at an alpha level of .05 in Chapter IV and Chapter V. Therefore when something is referred to as being significant or statistically significant, this equates to a less than five percent likelihood that the result is due to chance. Unless otherwise clearly indicated, significance

relates to an alpha equals five percent level. In the time series analysis (Chapter VII) when discussing autocorrelation plots, significance relates to an approximate two standard error band.

Assumptions

The following assumptions are made in this report:

1. The relationships that exist between the variables examined over the time periods examined are not changing.

2. The results from the BMDP time series analysis are valid.

3. The results from TSP are valid.

The second and third assumptions are of particular concern. In order to validate BMDP and TSP, the results of Box-Jenkins Gas furnace example (Ref 1:381-409) were compared to results of the same example from BMDP and TSP analysis. This test validated the acceptability of both BMDP and TSP.

Choice of Dependent Variable

There are numerous categories of accessions but the time series and regression segment of this report studies only one: Male High School Graduate Mental Category I-IIIA accessions (CAT13AM). This is done for two reasons: first, for continuity in the analytic phases of the study, and, second, because the other categories of accessions such as female, mental category IV, and prior service accessions are demand constrained whereas CAT13AM accessions are supply

constrained. Recently the Army has been able to focus almost all of its recruiting effort on CAT13AM accessions and has eliminated the accession of non-high school graduate and mental category IV personnel. One of the underlying objectives of this study is for it to be useful for Army personnel management policy makers and planners. Therefore the dependent variable studied in this report is CAT13AM.

IV. REGRESSION ANALYSIS

One of the main objectives of this report is to take the current model that the United States Army Recruiting Command (USAREC) uses to predict Male HSG Mental Category I-IIIA accessions and improve on its capability to account for the variance in accessions. The regression model is called the Enlistment Projection Model (EPM) and it is the first step in a process that USAREC planners and managers use to assign quarterly recruiting missions to the various District Recruiting Commands (DRC). The EPM and data base were provided for use in this thesis by USAREC Plans and Analysis Section. The focal point of this study is essentially Male HSG Mental Category I-IIIA accessions so that we only concern ourselves with this variable as a dependent variable. Table 1 is a summary of the variables used in the model and a brief explanation of their meaning. In Appendix A-1 is a sample of the USAREC data base and its associated input format.

The regression design statement used by USAREC in their SPSS Program was modified so as to specify an inclusion and exclusion level for variables to enter and leave the model and is as follows:

```
REGRESSION METHOD=STEPWISE/
           VARIABLES=AREA,REACT,HSSNR,QMA,RCTRS,NPSMACC,
           HSDMACC,UNEMP,RCTREX,INCOME,BLACKS,PROPEN,Q1VAR,
           Q2VAR,Q3VAR,DODRCR,AIDES,DODN,DODH,TOTCON,HSGCON,
           ADVCOST,DRCADV,CAT13AM,PSTOTACC,NPSFACC/
           REGRESSION=CAT13AM(*,2.0,*,1.99) WITH AREA,HSSNR,
           QMA,UNEMP,RCTREX,INCOME,BMA,PROPEN,Q1VAR,Q2VAR,
           Q3VAR,DODRCR,AIDES,ADVCOST,DRCADV,RCTRS,REACT/
```

The model was run for the five recruiting regions with following results:

Region	Adjusted r^2
NE	.75220
SE	.73807
SW	.68286
MW	.62862
WEST	.75133

Final models for each region are in Appendix B-1. It is important to note that we are not attempting to analyze the resulting equations that model accessions in the various regions. However, analysis of the results and the significance of various variables in the models did aid in the following chapters of this report.

Studying the results from the USAREC model and considering the meaning of some of the variables, we decided to develop a new variable called density that would be a reflection of some of the variables already in the model. Our perception was that several of the variables alone had hard-to-interpret meanings whereas in some functional relationship with other variables they would have more meaning. For instance, in several models DRC area in square miles (AREA) is significant as is on-production recruiters (RCTRS) and qualified military available (QMA). It seems to make sense that accessions might be tied to some sort of relationship between these variables such as Density = $\frac{\text{RCTRS}}{\text{QMA}}$ or Density = $\frac{\text{RCTRS}}{\text{AREA}} * \text{QMA}$. Density was computed as indicated and added to the data and the regressions were run again. Additionally, consideration was given to the possibility that

VARIABLE NAME	DATABASE COLUMNS	VARIABLE DESCRIPTION
TIME QTR	1-4	FISCAL YEAR & QUARTER
RGN,DRC	5-6	DISTRICT RECRUITING COMMAND CODE
AREA	7-11	DRC AREA IN SQUARE MILES
QMA	12-16	QUALIFIED MILITARY AVAILABLE
REACT	17-21	REACT LEADS (MAGAZINE ADS)
HSSNR	22-26	MALE HIGH SCHOOL SENIORS
RCTRS	27-30	ON-PRODUCTION ARMY RECRUITERS
NPSMACC	31-36	ARMY NON-PRIOR SERVICE MALE ACCESSIONS
HSDGMACC	37-41	ARMY HIGH SCHOOL DIPLOMA GRADUATE MALE ACCESSIONS
UNEMP	42-44	DRC OVERALL UNEMPLOYMENT
RCTREX	45-47	PERCENT OF DRC RECRUITERS WITH ONE OR MORE YEARS EXPERIENCE
RCTRSPCT	48-50	ARMY RECRUITERS AS PERCENT OF DOD RECRUITERS BY DRC
DODNPS	51-56	DOD NON-PRIOR SERVICE MALE ACCESSIONS
DODHSDG	57-62	DOD HIGH SCHOOL DIPLOMA GRADUATE MALE ACCESSIONS
INCOME	63-67	MEDIAN DISPOSABLE FAMILY INCOME
BMA	68-72	BLACK MILITARY AVAILABLE
TOTCON	73-76	ARMY TOTAL CONTRACTS
HSGCON	77-80	ARMY HIGH SCHOOL DIPLOMA GRADUATE MALE CONTRACTS
PROPEN	81-83	ACTIVE ARMY ENLISTMENT PROPENSITY
AIDES	84-87	HOMETOWN RECRUITER AIDES (AVERAGE)
CAT13AM	88-91	ARMY MC 1-3A MALE ACCESSIONS
PSTOTACC	92-95	ARMY PRIOR SERVICE TOTAL ACCESSIONS
NPSFACC	96-99	ARMY NON-PRIOR SERVICE FEMALE ACCESSIONS
DRCADV	100-103	DRC LOCAL ADVERTISING EXPENDITURES

Table I. Variables in USAREC Model

accessions are not driven by a linear function but rather that it might be some sort of a multiplicitive or Cobb-Douglas type production function of the form:

$$Y = e^{a_o} X_1^{a_1} X_2^{a_2} \ldots X_n^{a_n}$$

where Y represents accessions, the X_n's the various independent variables, and the a_n's their associated parameters. The equation is solved by ordinary least squares regression after utilizing a logarithmic transformation as follows:

$$\text{LnY} = a_o + a_1 \ln X_1 + a_2 \ln X_2 + \ldots + a_n \ln X_n$$

The coefficients generated by SPSS for the a_n's represent each of the variables elasticity with relationship to accessions. All of the models were run again taking a logarithmic transformation of all variables. In addition, a model was estimated with both densities in the equation. The resulting adjusted r-square for all models is in Table II. The SPSS output for only the final iteration of optimal models discussed below is in Appendix B-2.

From Table II it is clearly seen that in all cases the USAREC Model has been improved. By saying "improved" it is meant that more of the variance in the dependent variable is being accounted for by the independent variables. The model that does the best overall job is Model 4, the log transformation of the USAREC model including the variable Density = (RCTRS*QMA)/AREA. For the northeast, sourthwest and west regions the adjusted r^2 value is the highest value and for the midwest region the adjusted r^2 value is within

Table II. Listing of Adjusted r^2 for Various Enlistment Projection Models

Model Region	1 USAREC	2 LN of Model 1	3 Density 1= (RCTRS*QMA)/ AREA	4 LN of Model 3	5 Density 2= RCTRS/QMA	6 LN of Model 5	7 Both Densities In Model	8 LN of Model 7
NE	.75220	.76185	.75388	.76185	.75161	.76185	.75161	.76185
SE	.73807	.73661	.76889	.73661	.73807	.73661	.76868	.73661
SW	.68286	.71213	.68486	.71546	.68286	.71213	.68486	.71546
MW	.62862	.63073	.63679	.63073	.68262	.63885	.63679	.63890
WEST	.75233	.81162	.75248	.81231	.75133	.81162	.75248	.81231

.0082 of the largest value. That is not to imply that the key is the density variable. The summary of the final model for the northeast and midwest regions shows that density did not enter the equation modelling accessions (Model 1 and 4) and thus shows that the logarithmic transformation is responsible for the higher adjusted r^2 value. For the southeast region model 3 optimizes the adjusted r^2 value. Model 3 is the USAREC model plus a Denisty = (RCTRS*QMA)/(AREA). In this model, Denisty proved to be a very strong variable, entering the model at step 6 with a F value of 44.84.

For the sake of simplification, models 3 and 4 will be combined into one SPSS regression program with two regression design statements; one with a logarithmic transformation of the USAREC Model plus Density = (RCTRS*QMA)/AREA which is to be used to predict accessions for all regions except the southeast region and the second with the USAREC model plus Denisty = (RCTRS*QMA)/AREA which is to be used for the southeast region. A complete listing of this program is at Appendix B-3. This model will be provided to USAREC for use as a new Enlistment Projection Model.

Having evaluated all these models, there are some interesting relationships between accessions and the various independent variables. It might be expected that the more dollars spent on advertising the more accessions the Army would have, yet it appears that, in the midwest, dollars spent on advertising has a negative effect on accessions. Table 3 is a listing of variables that have unexpected negative

effects on accession rates. Additionally, in the southeast and southwest regions, the number of react leads has a negative impact on accessions. A react lead is counted when an individual responds to any form of magazine advertising. It is these types of relationships that prompted the next portion of this study. We attempt to determine what variables are factors affecting accessions and to classify possible recruits as being likely to join the Army or not.

Results and Conclusions

The USAREC model was enhanced by computing a new variable Density = (RCTRA*QMA)/AREA for the Southeast region and for all other regions by taking a logarithmic transformation of the previous model. However, there were several interesting and unexplainable relationships that appear in the models.

Recommendation for Future Research

There are many other variables that might further enhance the USAREC Model but due to time constraints we were not able to pursue them. Some examples are a wage differential variable and a percent annual pay raise variable. From this analysis questions arise as to what factors relate to Army accessions and how do they compare with the other services? What type of a person is likely to enter the Army? These questions will be addressed in Chapter VI of this report.

MODEL REGION	1	2	3	4	5	6	7	8
NE		LReact LDODCR		LReact LDODRCR	DODRCR	LReact LDODRCR	DODRCR	LReact LDODRCR
SE	React	LReact	DRCADV React	LReact	React DRCADV	LReact	React	LReact
SW	React Aides		React	LReact	React Aides		React	LReact
MW	DRCADV		DRCADV		DRCADV		DRCADV	
W	QMA DODRCR	LQMA	QMA	LHSSNR	QMA DODRCR		QMA DODRCR	LHSSNR

Table III. Variables With Regression Coefficients With Unexpected Negative Sign

V. Data Base Preparation

Topic Selection and Data Gathering

One of the many ongoing activities of the Army Research Institute (ARI) in Alexandria, Virginia, is its investigation of the Military Entrance Processing Stations (MEPS) data base to aid in answering a continuing chorus of questions at the highest levels of personnel management in the Army. The Personnel Research and Analysis Section at ARI (office: ARI-PERI-RP) suggested that their long run investigation could be aided through the employment of multivariate analysis techniques on a sample of the MEPS file. It was recommended that this study could most effectively be carried out by first building a "profile" of the general structure and content of the data base. Several areas of current interest to ARI were suggested as objectives for the investigation. Two of these objectives formed the basis of this thesis study:

1. Determine what factors influence fully qualified individuals to join the Army over other branches of the Military Service, and

2. Improve the Army's current predictive model of recruitment projections.

To aid in the pursuit of these objectives, it was recommended that more data and information be obtained from the operations researchers of the US Army Recruiting Command (USAREC) at Fort Sheridan, Illinois. USAREC (office: USAREC-PAE-RE) provided a complete copy of their recruiting model

input file, while ARI-PERI-RP was able to provide a useful random sample of the MEPS data base.

The data gathering phase also included an examination and modeling of a typical MEPS operation, and the MEPS site chosen for this research was Cincinnati. There, information was obtained on the characteristics of the MEPS operation, personnel flow, and the data being entered into the system. To verify the format of the elements being entered into the system, the MEPS Headquarters (MEPCOM) Data Automation Center was contacted. Throughout the study, both the ARI-PERI-RP and the USAREC operations research personnel aided the analysis with information and encouragement.

The data sample received from ARI was drawn from the MEPS Applicants File which contains 690 characters of personnel data on each individual who has applied for testing and entrance in any branch of the United States Armed Forces since 1976. The time slice of data that was made available for this study centered around personnel entering the Military Services in the 1980 to 1981 time frame. This particular sample consisted of a file containing 48520 records extracted at random from the MEPS file, selecting only records having a "9" as the last digit of the Social Security Number.

Selecting Variables that are Key to Recruitment Investigation

The first task involved identifying and extracting the "target" elements within the sample data, that is, to select and save on a separate file those variables in each record

that would be required to create the data "profile", and would later be used in the multivariate analysis. The file was meticulously screened to save all variables relevant to the study, while at the same time reducing the size of the records by eliminating variables that were either redundant or did not offer clear discriminating categories for future investigation. The sample was examined using the SPSS subroutines Frequencies and Crosstabs and using several short FORTRAN programs in order to develop a profile of the data base. The aims of this data examination were:

1. To eliminate those variables having too many blank data fields,

2. To eliminate, if necessary, records with invalid entries critical to the analysis,

3. To get a "feel" for the percentages within the categories that were available for testing,

4. To examine the relationships among variables,

5. To examine the computed raw Chi-Squared scores among the various categories, and

6. To discover any obvious patterns existent in the cross-tabulation tables.

There were a number of variables in the initial study of the MEPS file that were eliminated from the final model:

1. Number-of-Dependents,
2. Religious-Denomination,
3. Years-of-Education,
4. Mental-Category,

5. Youth-Program-and-Youth-Program-Conducted-by,
6. Program-Enlisted-for-Option,
7. Designated-Option,
8. Enlistment-Option,
9. Enlistment-Option-Guaranteed,
10. Enlistment-Bonus-Level,
11. Training/Enlistment-Military-Occupational-Specialty,
12. Term-of-Enlistment,
13. Pay-Grade, and
14. Citizenship-Code.

These apparently useful discriminating variables were deleted for the following reasons:

1. <u>Large numbers of blank data fields</u>

Religious-Denomination, Years-of-Education, and Citizenship-Code had a majority of uncoded records, rendering most multivariate analyses useless during the modeling of factors and discriminants.

2. <u>Incommensurable codes among both intra and inter-service categories of variables examined</u>

All of the "Option" code variables (6 through 9), and Enlistment-Bonus-Level had a significant number of codes that could not easily be measured or be generally related to other variables. Within Program-Enlisted-for-Option there were 33 different codes; the Army codes alone contained several levels of Veterans Educational Assistance Program (VEAP) kicker enlistment options, a number of different Tuition Assistance choices, several assignment electives, and many

combinations of the foregoing alternatives. Designated-Option has 35 different codes, while Enlistment-Option has at least 518 different codes among which include many permutations of such things as: Advanced Enlistment Grade, Unit or Location Guarantee, Training or Skill Guarantee, and Accelerated Promotion. Additionally, these variables have a less common measure or basis for comparison when trying to relate their numerous permutations between the different Services. It also became unwieldy to attempt to break these given variables down into their separate categories and model them as indicator variables. Another difficult variable to categorize and compare within and among services is the Enlistment/Training-Military-Occupational-Specialty code; the Army alone has about 300 specialty designations.

All of the aforementioned variables have a great deal of intuitive appeal for comparing what draws individuals to enlist in one branch of the Service as opposed to another. Indeed, the kinds of educational benefits, training, assignments, advancement potential, and job opportunities should be the very discriminating variables that would differentiate individuals from joining one branch of the Service over another. However, the problem boils down to an almost impossible task of sorting out, classifying, and subjectively weighting the numerous categories within the variables involved. Thus, these particular variables were dropped from further consideration.

3. <u>Frequent occurrence of erroneous data fields</u>

Mental-Category when compared against the Armed Forces Qualification Test (AFQT) scores had a substantial amount of miscoded data entries. The Mental Category codes did not agree with the limits set by AFQT scores for 10.6 percent of the records. ARI-PERI-RP personnel confirmed a problem with this data, and suggested that AFQT was a more accurate indicator of mental distinction. The "Option" codes also contained miscodes of "S" for "5", zero for character "O", and "2" for "Z" in many cases, along with a number of unrecognizable category codes. Also, the Number-of-Dependents variable contained an erroneous range of dependents in a range from 10 to 99 in about two percent of the file.

4. <u>Inability to substantially enhance the predictability of the final model</u>

Number-of-Dependents may have had a tolerable level of erroneous data, but it was decided to drop it due to the fact that 95 percent of the records had zero dependents, attributable to the high percentage of young, single individuals on the file. Thus, Number-of-Dependents provided very little variance to use for factor analysis and predictive purposes.

Years-of-Education (discounting blank fields) ranged from 1 to 24, with the distribution of data approaching the shape of a Normal curve, having a mean of 11.5 and a standard deviation of 1.3. However, years of education is not as exact a measure of educational achievement as is the variable

Level-of-Education, since the "worth" of a given number of years of education is only valued in terms of the type of diploma one has, not by how many years it took one to aquire that diploma. In addition, the Armed Forces place much emphasis on recruiting high school graduates as opposed to recruiting those who have twelve years of education but no high school diploma. And enlistees with a college degree have a much better opportunity for enlisting into uniquely qualified Occupational Specialties as well as officer training than do individuals with 16 or more years of education but no college diploma. Those who have completed a given "level of education" are by definition higher achievers than those who have received as many years of education, but who have not achieved the same <u>level</u> of education. Also, the Army prefers to recruit high school graduates over non-high school graduates. For these reasons, Years-of-Education, being less than an interval level variable, was deleted from the study, and Level-of-Education was retained in the study as a much more precise ordinal level variable.

Youth-Program-and-Youth-Program-Conducted-by was an insignificant variable because of the very small number of occurrences of individuals involved in such programs. Term-of-Enlistment was more like a dependent variable than a predictor variable; the term depends primarly on which component of the services an individual enlists into (National Guard, Reserves, or Regular), and on what options are selected which may require special service obligations. Finally,

Pay-Grade was deleted from the model since it too depends on options selected and whether an individual was prior service; also, most records tended to be coded "E1" Trainee.

The majority of variables on the original MEPS file and those used in the final analyses are nominal level variables. Several ordinal level arrangements were applied without success, such as ordering Service according to an arbitrary progression of "desirability", or arranging Race according to Census Bureau statistics of median family income. Also, no new information was gained from assigning interval values to ordinal level data such as treating Level-of-Education categories as integers. Since none of these variable alterations were fruitful, it was decided to recode each of the given variable categories as "dummy" (indicator) variables.

Index Variables: Time and Location

Early in the investigation a need was recognized to perform regional analysis on the MEPS file as well as to manipulate time variables in the data. Part of the goal of this study was to determine whether there existed a variance in military recruiting depending on time and geographical location. Both the time and the location variables presented difficulty in early attempts to correctly isolate and categorize their values and the variables related to them. There are a number of dates on the MEPS file associated with every record to include:

1. Date-of-Action,
2. Date-of-Birth,

3. Date-of-Entry,

4. Date-of-Entry-2,

5. Entry-or-Discharge-Date,

6. Date-of-Grade,

7. Projected-Active-Duty-Date,

8. Delayed-Entry-Program-Date-of-Entry,

9. Advanced-Individual-Training-Graduation-Date,

10. Date-Processing-Took-Place, and

11. Cycle-Number-Julian-Date.

The last two dates (items 10 and 11) each have up to ten occurrences depending on the number of transactions processed against any given individual, such as mental examination on one day, physical examination on another day, entry into Delayed Entry Program (DEP) another day, and possible enlistment into the Regular force at a later date. Based on the Date-of-Entry variable in the original MEPS data sample, 37.9 percent of the records belong to 1980, while 54.8 percent belong to 1981, and 7.3 percent are blank. Based on the Date-of-Action variable, 60.7 percent of the records belong to 1980, while 39.3 percent belong to 1981. Using the earliest of the Date-Processing-Took-Place entries in each record, 4.2 percent of the records belong to 1979, while 78.9 percent belong to 1980, with 16.9 percent in 1981.

Choosing the correct date was important to the profile building of the initial investigation, but it became even more crucial for the final analyses when the MEPS and USAREC files were unified in a study of the key variables from both

files. It became imperative in that final study for the variables to be combined into a meaningful sequence. ARI-PERI-RP faced the same problem of arriving at a date variable that would properly represent prospective accessions at a definite point in time.

ARI-PERI-RP representatives visited a Military Entrance Processing Station (MEPS) to examine the flow of personnel through the system and to understand the dates associated with the various transactions on the file. These representatives determined that using Date-of-Action, Date-of-Entry, or a combination of the two was not capturing the time closest to the prospective enlistee's decision to join the Service. Rather they suggested, following their thorough research, that the best date to use for this purpose was the earliest entry from Date-Processing-Took-Place. This preferred date was used in all subsequent analyses in this study, to include the crucial MEPS and USAREC file merging phase.

The location variable was not as elusive as the time variable, but choosing workable regional boundaries proved to be virtually impossible given the original regional variables on the MEPS file. The MEPS data base has the following location variables within each individual record:

1. Sector-ID (Eastern, Central, and Western),
2. MEPS-ID,
3. Home-of-Record, state and county,
4. Home-of-Record, ZIP Code,
5. Present-Address, state and county,

6. Present-Address, ZIP Code,

7. Transfer-to-Code (unit of assignment),

8. MEPS-Code (up to ten transactions),

9. Recruiting-Station-Identification,

10. Advanced-Individual-Training-Location, and

11. Test-Site.

One location variable used by ARI to generate regionality within their data is the MEPS-ID. There are 71 MEPS-ID's, each representing one of the processing centers where the potential enlistees are examined and inducted into the various branches of the Military Service. The problem with using this location variable is that it cannot be directly related to the Recruiting Regions and Districts that are the locus of Army recruiting efforts as well as the locus of the accession results of that recruiting. Compounding this problem is the fact that a group of individuals may all be recruited from the same ZIP Code and county but be processed separately at several different MEPS. Thus, there is no homogeneity for developing characteristics of population based on MEPS-ID. Recruiting-Station-ID cannot be used since it is not recorded on many of the records in the file. In addition, for those records in which Recruiting-Station-ID does appear, it is coded differently for each branch of the Service, and even the Army codes do not directly represent the five USAREC Regions or their 57 District Recruiting Commands (DRC).

Initial regional analysis of the file had to be based on MEPS-ID, but breaking the country down into these 71

processing locations was fruitless, especially given the nominal nature of most of the remaining MEPS variables, and given the fact that the MEPS-ID's could not be directly related to recruiting results of any given USAREC Region. In addition, any kind of multivariate analysis obtained from this type of regional breakdown could not easily be related to analysis of the USAREC data base.

Determining How to Link the MEPS and USAREC Files

The USAREC data base is organized by DRC within year and Quarter, thus giving each year a total of 228 records (57 DRC's times 4 Quarters). Each of these records contains summary statistics for the individual DRC's concerning demographics, economics, recruiter data, advertising, and accessions. The only time variable on the USAREC file is Fiscal-Year-and-Quarter. The only location variable is DRC; yet there is no regional variable on the MEPS file that is directly comparable or easily translatable into DRC. ARI was not aware of a conversion technique, but gladly welcomed our support in an effort to accomplish such a translation since several of their studies could benefit from having the ability to analyze the MEPS file by DRC. This was incentive enough in itself to launch an effort to translate DRC's for use in merging the two files and to eventually analyze the combined data base.

The first stage in DRC translation was to examine all prospective location variables, testing for adaptability in conversion and for completeness of record entries. That is,

any adopted conversion variable must be able to be precisely translated into a DRC code, and information must be consistently recorded in the conversion variable's data fields, meaning that there must be few, if any, blank entries. One thing to keep in mind in this research is that many MEPS data fields are intentionally left blank in order to economize coding effort, depending on the status of the individual at various stages in the testing-to-enlistment process. ZIP Codes were studied for a time until it was realized that ZIP Codes do not correspond to county boundaries, sometimes having a ZIP Code overlap different counties. Also, both USAREC and the Census Bureau organize their statistics along county boundaries, not by ZIP Code. USAREC-PAE-RE provided a map of these county boundaries by DRC and Region, which could be used to recode the MEPS state and county codes into DRC's.

The applicable location variables for state/county on the MEPS file are: Home-of-Record, state and county, and Present-Address, state and county. Examination of the data within these fields revealed that Home-of-Record had much more consistency in information being present than did Present-Address. However, it was felt that in those cases where Present-Address had valid information different from Home-of-Record, Present-Address should then be used. The logic in this is that Present-Address is a better indicator of the location from which an individual is recruited. With the proper state and county determined, the next step was to relate each county to its proper DRC.

DRC's do not overlap county borders, however, DRC's do overlap state borders, that is, any given DRC may contain counties from more than one state, and the respective states may contain parts of several DRC's. This means that a county to DRC conversion must be carried out on a county by county basis. Each county, all United States possessions, and certain foreign countries were recorded by their proper DRC and then coded into a FORTRAN program. This program was used to convert the county/states to DRC's while also converting and purifying several other variables on the MEPS data base, such as Level-of-Education, Race, Marital-Status, Service, and Sex, as well as creating or computing others such as Age, Hispanic, and a composite code for Status. The output generated by this program allows ARI for the first time to analyze the MEPS files using DRC codes. This is a capability beneficial to both ARI and USAREC since it facilitiates the further exchange of information between the MEPS and USAREC data bases.

Program for Merging the Data Bases

The groundwork having been laid for analyzing the MEPS file based on DRC and for relating the two data bases, the next task was to create a program that would do the actual merging of the MEPS and USAREC files. Since the USAREC file is composed of summary statistics organized by Quarter, while the MEPS file is organized as individual personnel records, there are two approaches that can be used to merge the files:

1. Condense the MEPS data into summary format by DRC by Quarter, or

2. Attach applicable USAREC data fields to each MEPS record by individual by DRC by month from the applicable Quarter. This given approach was taken since the primary concern was to analyze recruiting variables as they affected individuals.

The USAREC file contains chiefly ratio level data composed of demographic, economic, and accession statistics. Many of the variables pertain only to the Army and thus cannot be directly applied against the Navy, Air Force, or Marine records in the MEPS file. Among the variables not applied or merged with the MEPS file are: Percent-of-DRC-Army-Recruiters-with-One-or-More-Years-Experience, Army-Non-Prior-Service-Female-Accessions, and DRC-Army-Local-Advertising-Expenditures. However, these variables and others in the USAREC file were considered and used in the improvement of the USAREC Regression Model. Seven other variables were entered into the multivariate factor and discriminant analyses since these seven variables pertained directly to all of the Armed Services:

1. Qualified-Military-Available,
2. Male-High-School-Seniors,
3. DRC-Overall-Unemployment,
4. DOD-Non-Prior-Service-Male-Accessions,
5. DOD-High-School-Diploma-Graduate-Male-Accessions,
6. Median-Disposable-Family-Income, and
7. Black-Military-Available.

There is an eighth Army variable on the USAREC file that has a direct inverse relationship with the other branches of Service:

8. Army-Recruiters-as-Percent-of-DOD-Recruiters-by-DRC.

The information from these eight variables was merged with the data from the MEPS file based on the MEPS conversions of state/county to DRC and the conversion of Month to Quarter. The program that was written to do this merging function can merge a period of up to three years of data at a time, and can easily be modified to merge more years on a given run or modified and rerun several times to merge data for a group of years. This program is the final in a series of three programs that can be used by anyone having access to both the MEPS file and the USAREC file. These programs are written in FORTRAN so that the input and output formats can be easily modified to incorporate more or fewer of any of the variables located on either file. Thus, expansion or contraction of the numbers and kinds of variables to be analyzed is permitted with little recoding effort.

An option also exists to use only the MEPS file by running only the first two programs in the series. Thus, analysis of the MEPS data base can be done independently of the USAREC data and USAREC variables, but with the benefit of DRC recoding. This translated data gives ARI the capability of performing several of the DRC analyses that they could not do in the past. Output from both the second and third programs is highly compatible with SPSS input format and the data

manipulation requirements since it is almost all numeric in format, unlike the unrecoded MEPS file.

The output of the third program is a merged MEPS USAREC (MU) file containing the following variables:

1. Year,

2. Month,

3. DRC (first character is a Region code: 1,3,4,5,or 6),

4. Status, a composite variable based on the MEPS Status-Code for an individual record and on the MEPS-Entry Status. See Appendix A7 for an explanation of these variables. The following are the MU Status codes and their parent codes from the MEPS file:

1 = Qualified, Not Joined (MEPS Status-Code D, MEPS Entry-Status blank),

2 = Enlisted into Delayed Entry Program (DEP) (MEPS Status-Code A, MEPS Entry-Status 3),

3 = Enlisted without DEP (MEPS Status-Code A, MEPS Entry-Status Ø),

4 = Shipped Reservist from DEP (MEPS Status-Code B or C, MEPS Entry-Status 2),

5 = Shipped Enlistment from DEP (MEPS Status Code B or C, MEPS Entry-Status 1),

6 = Shipped without DEP (MEPS Status-Code B or C, MEPS Entry Status Ø),

Ø = all other combinations of MEPS Status-Code and MEPS Entry-Status.

5. Service (Army, Navy, Air Force, or Marines),

6. Component (National Guard, Reserve, or Regular),
7. Prior-Service Indicator,
8. Mental-Category (for reference only),
9. Armed-Forces Qualification-Test (AFQT) score,
10. Level-of-Education (Less Than HS Diploma, HS Equivalency, HS Senior, 1 year College, Associates or Nurse, Baccalaureate, Masters, Post Masters, or Doctorate/Professional),
11. Age (computed using MEPS Date-of-Birth and earliest Date-Processing-Took-Place),
12. Sex,
13. Race,
14. Hispanic (recoded from MEPS Ethnic-Group),
15. Marital-Status (Married, Never Married, or Other),
16. Qualified-Military-Available,
17. Male-High-School-Seniors,
18. DRC-Overall-Unemployment,
19. Army-Recruiters-As-Percent-of-DOD-Recruiters-by-DRC,
20. DOD-Non-Prior-Service-Male-Accessions,
21. DOD-High-School-Diploma-Graduate-Male-Accessions,
22. Median-Disposable-Family-Income, and
23. Black-Military-Available.

These 23 variables became the heart of all further research in the profile and multivariate analyses. The MU file merges the data base resources of ARI and USAREC, and can be used as a model for exchange of data resources between these organizations through the common link of DRC codes. Listings

of the three aforementioned FORTRAN programs can be found in Appendices C-17 through C-19.

Preliminary Analysis of the MU file

Several SPSS Cross-tabulation runs were carried out on the various MU variables, breaking the data out mainly by Service, by Region, and by Level-of-Education. The ARI-PERI-RP operations researchers encouraged this type of investigation since it would help in focusing on the key variables and the categories within variables to be evaluated. The researchers at ARI periodically examine the MEPS data base in this way in response to the many studies undertaken by their organization.

Based on the MEPS earliest Date-Processing-Took-Place entry that was used as the Month variable in the new MU file, only 4.2 percent of the data fell within 1979, with 70.5 percent of this being skewed to the last four months. The 1980 data was also skewed with the first four months containing only 10.0 percent of the 1980 data. The 1981 data included only January and February records. Some initial analysis was conducted on the 1980 records alone, while all later investigation down to the DRC level was conducted on the latest one year period from March 1980 to February 1981. For all practical purposes this means that only four quarters of USAREC data were involved in the study: from the second quarter of 1980 to the first quarter of 1981. The month of March in the first quarter of 1980 contains only 2.1 percent of the last 12 months of data.

The Year variable was combined into the Month variable by recoding January 1981 as month 13 and February 1981 as month 14. The MU Status variable was not considered in the final factor and discriminant analyses since it is more of a dependent variable than a predictor of whether an individual will join the Army over another branch of service. Under factor analysis the MU Service variable was recorded into four indicator variables, each representing a branch of the Service. Under discriminant analysis the MU Service variable was recoded into groups as Army and Non-Army. The MU Component variable was used to break the study down into three separate analyses, so that the factors affecting recruiting of National Guard, Reserves, and Regular enlistees could be investigated separately.

At the DRC level, the MU Prior-Service variable was used to examine only those without prior service since there are certain Service unique restrictions imposed on prior service enlistees. The Air Force, for instance, will not accept prior service individuals unless they enlist into critical skills. This fact tends to "push" unemployed prior service individuals toward enlistment into the Army, as is borne out in the initial analysis by region.

Additionally, the Prior-Service variable was used to delete prior service records from the final model because all branches of the Service are interested primarily in those factors that affect the recruiting of non-prior service male accessions. For this same reason the variable Sex was used

to delete all female records from the final DRC level analyses; the Services do not have to gear advertising or resources toward the recruitment of females because the quotas for female enlistments are easily being filled without special recuitment efforts in that area.

Records with blank Mental Category fields were eliminated from consideration in the analyses. The MU Level-of-Education variable was recoded into indicator variables as indicated in the variable list below. Race was also recoded to allow for indicator variables in both White (75.9 percent of MU file) and Black (19.8 percent of MU file) records. Finally, Married was established as a separate indicator variable based on the Marital-Status variable.

The data on the MU file was not altered, rather certain variables were recoded using SPSS "IF" statements to create "dummy" (indicator) variables, while certain other variables ceased to be considered in the final analyses at DRC level. The following is a list of all the recoded variables used as input to the multivariate analyses:

1. Month,
2. DRC,
3. Army,
4. Navy,
5. Air-Force,
6. Marines,
7. AFQT score,
8. No-High-School-Diploma,

9. High-School-Senior,

10. High-School-Diploma, but less than college degree,

11. College-Degree,

12. Age,

13. White,

14. Black,

15. Hispanic,

16. Married,

17 - 24. the eight USAREC variables.

Once the key variables had been selected and the data base constructed, the next phase of the study could be performed, namely the multivariate classification analyses: Factor Analysis and Discriminant Analysis using SPSS subroutines.

VI. Multivariate Analyses

Factor Analysis

The factor relationships among the variables were studied at the national, regional, and DRC levels to focus on and uncover any tangible demographic differences among prospective recruits. Armed with this data profile and the related statistics, the planners at USAREC might better be able to channel resources to meet the needs of a particular region and DRC based on known critical factors influencing a particular segment of the nation. Understanding where there do and do not exist differences in a particular variable's relationship with other variables and what those relationships are can often give the decision maker a key to the realignment of scarce resources.

Initial analysis and the cross-tabulation runs showed that there existed a substantial difference in the data by Component (National Guard, Reserves, and Regular). There were no Navy or Marine National Guard and very few Air Force Reserve records on the MEPS file. Also, the different components were logically best analyzed in separate categories since the Regular forces have a different mission than the Guard or Reserves. When the forces were broken down by component, there were not enough record samples in the Guard to do separate analysis of this component. In the Reserve there were only enough records to carry out analysis down to the regional level. There were, however, enough Regular forces records so that both factor and discriminant analysis

could be performed down to the DRC level on the Regular component.

Regional level analysis was conducted both with and without prior service and female records, while all analysis at the DRC level was performed only on male non-prior service records.

How to Read the Factor Analysis Tables

The factor analysis results are given in tabular form by Region and by DRC. Explanations of variables and codes for multivariate analysis are given in Appendix C-1. The complete set of Factor Tables is given in Appendices C-2 through C-4:

C-2 = Factor Analysis Tables by DRC,

C-3 = Factor Analysis Table by Region for Regular Forces, and

C-4 = Factor Analysis Table by Region for Reserve Forces.

Appendix C-2 should be referred to while reading the following explanation of the Factor Tables. The various principal components (factors) are listed across the top of the table. In the upper half of the table are listed the variables (by row, e.g., Army, Navy) which make up the various factors. In the bottom of the table are the different DRC's for a given Region (e.g., 1A, 1B); and included on the left hand side is a column of numbers representing the percentage of information that the factors have retained from the original variables. Interpretation of the factors is

accomplished by knowing from what variables the given factor is derived and recognizing how much weight a given variable contributes to the composition of the given factor.

These variable weights are based on the values of the factor loadings, which are given as matrix output from SPSS. Signs for the factor loadings are important in explaining positive or negative changes in the value of the factor. The factor value will tend to increase when variables with which it has high positive correlations increase, and decrease when negatively correlated variables increase in value. Thus the positive and negative correlations of the given factor can be thought of as positive and negative "poles" of the factor, and the correlated variables are associated with the positive or negative "pole" depending on their correlation sign. Since values in the factor loadings matrix are correlations, they must be squared to determine the percentage of contribution they provide to the explanation of any given factor. The tabular output results take this into consideration by assigning "measures" within the cells of the Variable by Factor part of the table as follows:

"++" = 50 to 99 percent of the variable is like the positive "pole" of the factor,

"--" = 50 to 99 percent of the variable is like the negative "pole" of the factor,

"+" = 25 to 50 percent of the variable is like the positive "pole" of the factor,

"-" = 25 to 50 percent of the variable is like the negative "pole" of the factor.

The table is intended to be read using the following algorithm:

1. Select a DRC of interest.

2. Read across the selected DRC row until an "X" is encountered. This signifies that a given factor in the column above is associated with the selected DRC.

3. Read up the "X" column until a "++", "--", "+", or "-" is encountered. This signifies that a given variable is associated with the given factor.

4. Read across the row to the left to find the associated variable and note the variable name.

5. Go back along the row to the given factor column.

6. Repeat steps 3 through 5 until the top of the table is reached.

7. Record a preliminary interpretation for the combination of the noted variables and call this interpretation a factor.

8. Go back down the column to the original DRC row.

9. Repeat steps 2 through 8 until the right hand side of the table is reached.

10. Analyze the recorded factors among themselves for a within DRC comparison.

11. Repeat steps 1 through 10 until all individual DRC's of interest are analyzed.

12. Analyze all DRC's of interest between DRC's.

With these Factor Tables one can compare DRC's with each other or by comparing one table with another table, compare different Regions with each other. Thus, one can quickly refer to the factors facing recruiters within any given DRC and then make comparisons by DRC or Region to see what factors other recruiters face. At the managerial level, one may be able to use the tables to aid in the allocation of scarce resources depending on the profile characteristics of a given Region or DRC.

<u>Factor Analysis Interpretation</u>

The first DRC in Appendix C-2 is DRC 1A (Albany) with associated factors in columns 1, 10, 15, 17, 20, 26, 32, and 39. For convenience, column 1 will be referred to as "factor 1", column 2 will be referred to as "factor 2", and so on. Factor 1 is composed of a strong increase in accessions accompanied by a strong increase in unemployment rates, with a slight positive correlation associated with an increase in the number of Army recruiters. Thus, one can interpret factor 1 as a barometer for accessions which will increase or decrease in the same direction as the increase or decrease in the percentage of unemployment, and <u>slightly</u> "influenced" by movement in the same direction of a change in the percentage of Army recruiters in the DRC. It should be noted at this point that only DRC's 1A (Albany), 1G (New Haven), and 1N (Syracuse) have this particular relationship within Region 1. However, DRC 1D (Concord) in factor 2 has a stronger correlation between the increase in percentage of

Army recruiters and the increase in accessions. Continuing in this vein, factor 3 shows that the other DRC's in Region 1 have <u>no</u> noticeable link between an increase in percentage of Army recruiters and the increase in accessions. However, factor 3 still strongly correlates increases in unemployment with an increase in accessions in <u>all</u> of the DRC's in Region 1. As one reads across to see what factors are present in a given DRC, one should freely perform a simultaneous analysis of related factors in other DRC's in order to quickly compare how the DRC's differ among one another. This gives the user a better grasp of the distribution of factor influences within the entire Region; and it is an aid to understanding the structure of a given factor in a particular DRC by relating it to similar factors in other DRC's.

Factor 10 in DRC 1A (Albany) shows that as time increases there is an accompanying increase in the median family income as well as an increase in the number of male high school seniors in the given DRC. One should keep in mind the period over which this analysis was performed, that is, March 1980 to February 1981. Only DRC 1A (Albany) and DRC 1G (New Haven) have the factor 10 relationship, while in DRC 1E (Harrisburg) factor 9 shows a strong <u>negative</u> correlation between number of male high school seniors versus the month and income variables. That is, in DRC 1E (Harrisburg) as months and income increase the number of seniors decreases. Another closely associated factor is

factor 8 in DRC 1B (Baltimore) and in DRC 1F (Fort Monmouth), which is really an enhancement of factor 10 in that the percentage of Army recruiters strongly moves in the same direction with months, income and the number of male high school seniors. In this same manner, factor 7 in DRC 1L (Pittsburgh) is an extension of factor 9, showing that an increase in percentage of Army recruiters is correlated with a decrease in the number of seniors. Other factors reflecting the month and income variable influences are factors 4, 5, 6, and 11.

Factor 15 in DRC 1A (Albany) is the race factor which is a relationship that is present in 31 of the 57 DRC's. Factor 16 is another race factor but it contains the slight influence of AFQT. Factor 17, college degree is a <u>separate</u> ingredient or principal component in DRC 1A (Albany). Factor 17 is separate in <u>most</u> of the DRC's, however it is sometimes correlated with other variables such as with age in DRC 1G (New Haven) and in DRC 1L (Pittsburgh). Factor 20 in DRC 1A (Albany) shows a dichotomy between high school senior recruits and high school diploma recruits with a strong linkage to the age of the recruit. Factor 26, the Army variable correlated with the No-High-School-Diploma variable, is also evident in DRC 1A (Albany). This factor implies that non-high school diploma recruits tend to join the Army in DRC 1A (Albany). Other factors in this DRC include the Marines as a factor by themselves. Also, the Navy and Air Force are one category, although the signs

between these Service variables are opposite. The Air Force versus Navy factor by itself simply implies that recruits from these two services have virtually opposite association among the other variables in the sample from DRC 1A (Albany). That is, one can distinguish the recruits between these two services based on the other variables in the analysis.

As a cautionary note, the preceding interpretation of factors must be combined with all the other facts available concerning the DRC for the given period of analysis. Common sense and good management are essential in any use of these findings. Also, exact interpretation of the factors is not always possible. All factors in a given DRC are orthogonal, that is, each factor is independent of all the other factors. Possibly the safest way to handle comparisons of large numbers of factors is to use the technique of hyphenation between the variables for a given factor to form a chain of variables naming the given factor. This is possibly a more precise method of carrying meaning, but it lacks interpretation and ease of handling. Also to be noted is the percentage given in the left hand column in the bottom half of the table. As an example, the percentage for DRC 1A is only 78, which means that 22 percent of the information contained in the original variables is absent from the factors shown in the table for that DRC. These cautionary notes must be kept in mind when performing analysis on demographic data that is hard to measure and prone to subjective interpretation.

The analysis of factors points out the principal components that recruiters face in a given DRC. At the same time, relationships are examined between DRC's and between similar factors as an aid to the understanding of the principal components which affect the given DRC. This same procedure can be applied to regional level analysis as well. Regional level managers may be able to use the factor analysis to redirect resources through an understanding of the differences between DRC's based on the different factors affecting the individual DRC's. It is important that these factors be interpreted within and between DRC's in order to realize the full fruit of the factoring technique. That is why the tables presented in this study are constructed for ease of this type of "within and between" comparative analysis of factors by DRC and Region.

Conclusions about the factor analysis are easily drawn by extending beyond the interpretation of the principal components or factors. For instance, the Race factor which has the slight correlation with AFQT in certain DRC's can be examined nationwide. If one plots the geographical location of the presence of the Race-AFQT factor on a map, one will see a prevalence of this factor in the southern states, and in certain heavily populated areas. This could possibly mean that AFQT test questions are geared toward one cultural segment of the country. Another factor, the Army correlation with No-High-School-Diploma, factor 26 in Region 1, shows that non-high school graduate recruits are

principally associated with the Army. This may be an unpalatable interpretation for the Army to accept. However, the idea is to make the recruiting manager aware of the presence of a factor with this type of configuration and thus aid him in aligning or reallocating scarce resources such as advertising in the given DRC. For instance, it may tell the recruiting manager that this particular DRC needs more advertising showing high technology Army weapons, Army computer technicians at work, and the numerous educational benefits available to Army recruits.

The overall aim of this analysis is to provide the manager with an additional tool to focus on the factors affecting recruiting by individual DRC and Region. With this added information the manager should be able to make better decisions on the allocation of scarce recruiting resources; and the higher level recruitment planners should be better able to determine whether to continue or alter recruitment policies.

Discriminant Analysis

The primary aim of discriminant analysis in this study was to discover the identity and magnitude of the principal variables that could be used to distinguish Army accessions from non-Army accessions. This analysis was carried out at the national level, the regional level, and the DRC level. Only Regular Forces were examined at the DRC level. USAREC and ARI planners should be able to use the discriminant analysis procedures developed in this study to better

understand the differences between Army and non-Army accessions. The comparative analysis techniques presented herein can aid operations research analysts at ARI and USAREC to differentiate variables that are critical to Army recruitment in the various DRC's and Recruiting Regions.

Factor analysis and cross-tabulation runs had pointed to a difference among Recruiting Regions and among Components (National Guard, Reserves, and Regular) for all analyses involving differentiation by the Service variables (Army and non-Army). It was therefore decided to begin this portion of the study by doing discriminant analysis on the MU file Regions and Components. That is, the variable "Region" was specified with the SPSS keyword "GROUPS=" as the variable to be evaluated under discriminant analysis. Likewise, the variable "Component" was evaluated under an independent analysis. The purpose of this examination was to test whether these two variables exhibited group differences as they had done in the factor and cross-tabulation analysis. Finally, based on the results of the analysis by Region and Component, "Service" was evaluated as the "GROUPS=" variable to form the core of the discriminant analysis.

The results of testing the Regions as groups and testing the Components as groups showed that there was evidence of differences both among Regions and among Components. The discriminant analysis test of Regions revealed that 72.6 percent of the cases could be correctly classified by Region based on the discriminant equation using all the MU

file variables except Status and Component. The first function had an eigenvalue which accounted for 75.10 percent of the variance. The canonical correlation for this first function was very strong at .8569 and the Wilks Lambda value was extremely significant at .1219. The Component variable had less dramatic differences with 58.4 percent of the sampled cases correctly predicted, a first function percent of variance at 88.77, a canonical correlation of .302, and a Wilks Lambda of .8973. The results of these two tests confirm the suspicion that the MU variables are influenced by regionality and by component of service. Thus, as in the case of Factor Analysis, it was decided to break the discriminant analyses down into separate tests by Region and by DRC for all tests concerning the determination of differences between the Army and the non-Army groups.

Sir Maurice Kendall in Multivariate Analysis (Ref 15: 177) says that "... the amalgamation of classes may give rise to misleading conclusions", as is demonstrated in "Simpson's paradox." Simpson's paradox can be exhibited through contingency tables where two sub-tables are created from a parent table, each table having the same row and column categories. The two sub-tables may be tested and yield one conclusion about the association of the tabled categories; however when the parent table is similarly tested it yields a completely opposite conclusion about the association between the categories. For example, the tabled categories may be Service versus Education Level, the

two sub-tables may be Region 1 and Region 3, while the parent population would be the combination of the two Regions. Simpson's paradox in this case would occur if the contingency tables for Region 1 and for Region 3 showed there was a difference between Service and Education Level, yet the parent contingency table composed of the two Regions added together showed no difference existed between Service and Education Level. Sir Kendall recommends that classification type of analyses be carried out at the lowest level feasible, that is, that the analysis be broken down into sub-categories to the lowest level that still permits enough cases per cell and is not prohibitively costly in terms of computer resources.

Following Sir Kendall's advice, this study broke the analysis down to the DRC level in the case of the Regular Forces. However, there were not enough differentiable records in the Reserve Forces to do analysis down to the DRC level; nor were there enough cases in the National Guard Component to accomplish discrimination at the Regional level. There are no Navy or Marine National Guard records, and only a small percentage of Air National Guard on the file. It should also be noted that some Regions had no Air Force Reserve records on the MU file; however, there were enough Army versus non-Army Reserve cases to accommodate analysis by Region. The Prior Service and Sex Variables were used to further classify the final analyses; Regional level scrutiny of the MU file involved discriminant analysis both with

and without the prior service and female cases. DRC level study was done without prior service and female records since the main Army recruitment focus is on non-prior service male accessions, thus following Sir Kendall's recommendation concerning categories.

The USAREC "Intensity" Variables

The USAREC variables on the MU file are treated as "barometers" of demographic and economic conditions which affect each individual whose records are on the MU file. These barometers indicate by DRC and by quarter the "intensity" that certain demographic and economic variables have on individuals. Six of the USAREC variables are fairly straight-forward predictor variables which affect the individual; the other two variables are usually used as dependent variables in recruitment modelling. The latter two variables on the MU file are DOD-Non-Prior-Service-Male-Accessions, and DOD-High-School-Diploma-Graduate-Male-Accessions. To accommodate both the role of predictor and non-predictor for these accession variables, two sets of discriminant analyses were generated down to the DRC level, so that the user may choose the equations and relations among variables that are most suitable to his interests.

The following is a short summary of how the eight "intensity" variables affect the individual:

1. Qualified Military Available and Male High School Seniors: These two variables give an indication of the supply side of the manpower market relating to how much

the individual must compete to get into the military. The Army in 1982 did not have to accept non-high school diploma recruits. "The Marines are looking for only a few good men."

2. Black Military Available: Same as part 1 above, plus there is a demographic intensity in terms of an important racial group in today's Army. The density of the black population in a given DRC may well have an impact on whether an individual (black or white) will join the Army from a given DRC.

3. DRC Overall Unemployment Rate and Median Disposable Family Income: These variables exhibit the economics of a given DRC that will "drive" individuals toward or away from military service.

4. Army Recruiters As Percent of DOD Recruiters by DRC: The "intensity" of Army recruiters as a ratio of the overall number of DOD recruiters in a given DRC supplies an indication of the inter-service "competition" for recruitment in that DRC and the individual's likelihood of contact with Army type recruiters as opposed to other service recruiters.

5. Finally, the two accession variables: These are technically <u>output</u> of the recruitment process, not true predictive variables. However, the number of accessions closely parallels accession quotas which are based on projections of a DRC's ability to provide recruits in a quarter. Therefore, these accession variables could be treated as accession quotas, giving a measure of the "intensity" of

the demand side of the recruiting economics. As in all supply and demand systems, the intensity of demand in the market place has an impact on how many individual suppliers will be willing to come in.

The Discriminant Analysis Tables are organized in rows of standardized coefficients by DRC. This facilitates comparison within any given DRC among the standardized coefficients to show which variables are of greatest relative importance in predictive ability. Comparison between DRC's can be made by noting which variables are important in one DRC as opposed to the variables that are important in another DRC. This is somewhat similar to the comparative techniques that were employed to relate factor differences in the factor analysis. However, variable relations and intensities under factor analysis will not correspond exactly with the importance of given variables in discriminant analysis. This is due to the fact that factor analysis attempts to determine how each of the factors relate to all of the others, while discriminant analysis tries to find in selected variables the discriminating features for one "group" type variable. Therefore, for the factor analysis in this study, the aim was to find relationships among the important variables that may relate to recruiting, while discriminant analysis was concerned with finding the variables and their relative intensities that differentiated Army recruits from non-Army recruits.

How to Read the Discriminant Analysis Appendices

Appendix C-5 through Appendix C-16 contain the numerical results of the discriminant analysis performed in this study. These Appendices contain the following classes of information:

C-5 = Discriminating Power of Discriminant Functions by DRC, No Accession Variables,

C-6 = Discriminating Power of Discriminant Functions by DRC, With DOD Accession Variables,

C-7 = Discriminating Power of Discriminant Functions by Region, No Accession Variables,

C-8 = Discriminating Power of Discriminant Functions by Region, With DOD Accession Variables,

C-9 = Standardized Canonical Discriminant Function Coefficients by DRC, No Accession Variables,

C-10 = Standardized Canonical Discriminant Function Coefficients by DRC, With DOD Accession Variables,

C-11 = Standardized Canonical Discriminant Function Coefficients by Region, No Accession Variables,

C-12 = Standardized Canonical Discriminant Function Coefficients by Region, With DOD Accession Variables,

C-13 = Percentages of Cases Correctly Classified into Army and Non-Army by DRC, No Accession Variables,

C-14 = Percentages of Cases Correctly Classified into Army and Non-Army by DRC, With DOD Accession Variables,

C-15 = Percentages of Cases Correctly Classified into Army and Non-Army by Region, No Accession Variables, and

C-16 = Percentages of Cases Correctly Classified into Army and Non-Army by Region, With DOD Accession Variables.

Appendices C-5 through C-8 are each organized into five columns containing: Canonical Correlation, Wilks' Lambda, Chi-Squared, Degrees of Freedom, and Significance. Appendices C-6, C-8, C-10, C-12, C-14, and C-16 contain only those DRC's or Regions whose discriminating functions were modified with the addition of the DOD Accession variables, implying that DRC's or Regions which are not listed in C-6, C-8, C-10, C-12, C-14, and C-16 have no increase in predictability when the Accession variables are included. The national and regional level results in Appendices C-7, C-8, C-11, C-12, C-15, and C-16 contain output that falls into two categories:

1. Analysis including prior service, non-prior service, male, and female fully qualified applicants, and

2. Analysis including only non-prior service male fully qualified applicants.

The first of these categories will have a "PS,F" (prior service and female) indicator in the column marked

"Component & Region." The components are abbreviated "RSV" for Reserve and "REG" for Regular. The regions are the five standard regional numbers: 1, 3, 4, 5, and 6. Thus, a typical "Component & Region" mnemonic would be "RSV3 PS,F" meaning Reserve, Region 3, with prior service and female applicant cases included. In all cases when prior service and female cases are added to the analysis, both the "Prior Service" and the "Sex" indicator variables come into the models as significant predictors in the discriminating functions for Army versus non-Army. As was pointed out earlier, detailed analysis at the DRC level focuses only on the most sought after "target" group, non-prior service males.

The canonical correlation values in Appendices C-5 through C-8 give one measure of discriminating power by showing the relative association of the discriminant function with the dummy variables Army and non-Army. The second measure of discriminating power is given in the value associated with the Wilks' Lambda, its conversion to a Chi-Squared approximation, and the resulting significance value. The Wilks' Lambda is an inverse measure of the discriminating power of the original variables, so that the lower values of Wilks' Lambda imply greater separation of the Army versus non-Army groups. The results contain a Chi-Squared measurement based on a transformation of Wilks' Lambda which is asymptotically Chi-Squared distributed. Finally, the results are converted to a significance value for hypothesis testing: the lower the value in the Significance column

the greater is the probability that the Army versus non-Army groups are distinguishable. Appendix C-5 can be examined at alpha equal .01, meaning that values in the Significance column above .01 imply the rejection of the hypothesis that the Army versus non-Army groups are indistinguishable with 99 percent confidence.

Appendices C-9 through C-12 give only an abbreviated form of the standardized coefficient rounded to the hundredths decimal place. The purpose of these four appendices is to give the reader a tool for comparative discriminant analysis among DRC's and Regions, <u>not to give final exact equations</u>. Since this study only involved a sample from the MEPS data base, it would be wise to compute exact coefficients from the whole data base rather than rely on this sample. The procedures and programs as outlined in this thesis are designed to accommodate this type of exact analysis. Therefore, the results of the MEPS sample data are confined to comparative analysis within and among the DRC's and Regions, and highlight those variables most critical to these Regions and DRC's.

The standardized coefficients in Appendices C-9 through C-12 show the relative weights that the different variables have in predicting Army versus non-Army accessions. All positive coefficients imply that as the value of the respective variable goes up so does the likelihood that the given individual or "target" case will join the Army. All negative coefficients say that the respective variables point

toward the individual having a tendency to join another branch of service. By comparing standardized coefficient magnitudes of variables within a DRC, one can come to understand which variables have a greater impact in the DRC, and by how much this impact will influence an individual to join the Army. To compare DRC's with each other, one simply has to look down the columns of Appendices C-9 through C-12 and see which DRC's do or do not have standardized coefficients in the different variable columns. However, relative weights of coefficients can not be assigned when comparing between DRC's since the values of the centroids are not the same in each DRC.

Appendices C-13 through C-16 show the percentages of individuals that were correctly predicted to go into the Army or not based on using Fisher's Linear Discriminant Function Coefficients and plugging in the variable values of each individual on a case by case basis. This final measure of the effectiveness of the classification process is divided into two parts on each page of Appendix C-13 through Appendix C-16. The first part shows the results of using the classification function to predict the groups of the analyzed cases which created the function in the first place. The second part shows the results of calculations performed on a random sample of the data different from the data that created the function.

Results of the Discriminant Analyses

Most of the canonical correlations have values between .300 to .599, showing that the derived discriminating functions are moderately correlated with the Army versus non-Army groups. DRC's having lower than "moderate" correlation of less than .300 are: 4D (Denver), 4J(Oklahoma City), 5B (Cincinnati), and 6E (San Francisco). When the DOD Accession Variables are added, only 4D (Denver) increases in predictability enough to move into the "moderate" range. At the national and regional levels, three analyses have canonical correlations above .599, namely: RSV3 PS,F (Reserve, Region 3, with prior service and female); RSV3 (Reserve, Region 3, no prior service nor female); and RSV6 PS,F (Reserve, Region 6, with prior service and female). The addition of the Accession variables at the national and regional level had no notable effect on the results.

The second measurement of discriminating power, summarized in the Significance value, shows that the following DRC's have a questionable amount of discrimination between the Army versus non-Army groups: 3F (Louisville), 4D (Denver), 4J (Oklahoma City), 5E (Des Moines), 6E (San Francisco), and 6H (Phoenix). When the DOD Accession variables are included, only 4D (Denver) improves in predictability. In addition, even at an alpha value of .05 (95 percent confidence), there would still be questionable discriminating ability in 4J (Oklahoma City), 6E (San Francisco), and 6H (Phoenix). Researchers using the discriminant function

coefficients generated for these particular DRC's should keep in mind that there is a significantly greater chance for error in the predictive ability for these DRC's. At the national and regional levels, the Significance values show a confidence level of better than 99.99 percent.

Appendices C-9 through C-12 show standardized coefficient relationships within and between the various DRC's and Recruiting Regions. The most obvious pattern throughout these appendices is the strong negative relationship that the Armed Forces Qualification Test (AFQT) scores have with people joining the Army versus the other services. Only a few DRC's do <u>not</u> exhibit this relationship: 1J (Niagara Falls), 3C (Charlotte), 4A (Albuquerque), 4C (Dallas), 4J (Oklahoma City), 5C (Cleveland), 5E (Jacksonville), 6I (Portland), and 6J (Sacramento). The next strongest association of a large number of DRC's is to the variable "Age", which shows relatively large coefficient weights in most cases. The Age variable demonstrates that the older an individual is, the greater is the likelihood that the individual will choose the Army in most DRC's, with the reverse taking place in 1A (Albany), 4H (Little Rock), and 5E (Des Moines). At the national level both the "Prior-Service" and the "Sex" variables are linked to the Army, meaning that being male and having had prior service tends to help predict that the individual will join the Army.

An important variable that must be read with caution is ArmyR (Army Recruiters as Percent of DOD by DRC). This

critical variable can show by DRC how much effect the percentage of recruiters has upon an individual choosing the Army. However, great care must be taken in analyzing a limited number of data samples; only four quarters, that is four separate data points, per DRC were merged from the USAREC file since the MEPS file data contained a limited time period. There were nine DRC's that actually showed a negative trend as the percentage of Army recruiters increased; that is, as relatively more Army recruiters were present in certain DRC's, the applicants tended to join the other services. These nine DRC's were: 1E (Harrisburg), 4C (Dallas), 4D (Denver), 4E (Houston), 5E (Des Moines), 5J (Milwaukee), 6L (Seattle), and, when the Accession variables are added to the predictive model, 1I (Long Island), and 4F (Jackson). No definite conclusions should be drawn from these results until further analysis has been conducted over a longer time period. As has been repeatedly stated in this study, the driving purpose of this thesis effort is to establish a set of programs and procedures for the in-depth analysis of these sort of phenomena.

The last set of appendices on discriminant analysis, C-13 through C-16, give the results of the percentage of cases which were correctly classified by the derived discriminant functions. The obvious trend in these results is that the discriminant variables are slightly more often correct in predicting that an individual will join the other branches of service, than when these same variables are

used to predict that an individual will join the Army. That is, correct classification of Army applicants is less than the correct classification of non-Army applicants, in most DRC's. However, six DRC's show consistently better predictive ability for Army applicants over non-Army applicants: 3A (Atlanta), 3D (Columbia/Fort Jackson), 4A (Albuquerque), 5D (Columbus), 5L (Omaha), and 6F (Honolulu). Thus, in these six DRC's the percentage of correctly predicted Army applicants is higher than the percentage of correctly predicted non-Army applicants. At the national and regional levels these relative percentages are more evenly distributed, with no obvious trend.

In summary, the results of Appendices C-5 through C-16 lay down a format for research into the critical variables affecting Army versus non-Army recruitment. The analysis that surrounds these appendices provides a set of procedures to be used in examining the key relationships among the variables and their weighted effect upon the dependent group variables Army and non-Army. The analysis carried out down to the DRC level gives the researcher a clear picture of the effects of the specific set of variables that affect recruitment within a given DRC. At the same time, the analyst is able to compare coefficient weights to determine relative strengths among the critical variables. At the global level, the structure of the appendices allows the researcher to analyze the differences <u>between</u> DRC's, to note which variables deserve further investigation over different periods

of time, and which DRC's exhibit noteworthy countermovements to overall trends in the data base. The techniques and formats developed in this study can easily be expanded through the incorporation of more variables from Census Bureau statistics or other demographic and economic information available to USAREC and ARI. These results can then be further refined using longer time periods, and more data samples for the National Guard and Reserve. The ultimate aim would be to create very precise predictive models at the DRC level that could be used in ARI's continuing research concerning recruitment indicators, and in USAREC's efforts to optimally allocate scarce resources.

VII. TIME SERIES ANALYSIS

Introduction

This chapter presents the time series analysis, utilizing the techniques of Box and Jenkins, as performed on the accessions data shown in Appendix A-2. The modelling was done in two phases. First, Male High School Graduate Mental Category I-IIIA accessions (ACC13AM) was modelled as a simple time series and, second, unemployment rates, the producer price index and the prime rate were used as input variables with ACC13AM as the output variable in three leading indicator models.

General Information

It was initially hoped to use the data directly from the USAREC file to model ACC13AM. However there were only 22 data points (quarterly from mid 1976) and, in order to perform meaningful analysis using Box and Jenkins techniques, at least 50 data points are needed (Ref 1:18). Thus began the "Great Data Chase."

In earlier readings on the subject, to validate the hypothesis that the Army advertising dollar was well spent, N.W. Ayer had used Male High School Graduate Mental Category I-IIIA monthly accession data from April 1976 to March 1980. Accession data was requested from the United States Army Recruiting Command (USAREC) from January 1980 to the present. The overlapping data was requested in order to insure a "good" set of data when paired with the N.W. Ayer data.

Unfortunately, the new data from USAREC did not match the N.W. Ayer data. This anomoly was explained by a USAREC official as a problem of renorming the accession rates.

In the late seventies and early eighties tests that determined a potential recruit's mental category were compromised and personnel were categorized in mental categories higher than they should have been. Recently, in an attempt to rectify the bookkeeping, records have been checked and the accession rates adjusted to reflect a more accurate representation of the quality of recruits entering the services. These renormed rates were not available when N.W. Ayer conducted their study. USAREC personnel suggested contacting the "keepers of the data," the Defense Data Manpower Center (DMDC) in Monterey, California. From the Army Liason Officer in DMDC, monthly renormed Male High School Graduate Mental Category I-IIIA accession data (from October 1975 to July 1982) was received.

Once the data was received, the 81 points were analyzed in two ways. First, the points were analyzed as a simple time series. This was done in order to compare predictions with the second phase of the time series analysis. The second phase utilized Box and Jenkins leading indicator techniques with the unemployment rate, producer price index and prime rate as input or independent variables and the accession data (ACC13AM) as the output or dependent variable.

Modelling (Phase I) - ACC13AM as a Time Series

Appropriate computer output for this phase of modelling

is in Appendix D-1 through D-6.

Accession rates were modelled as each value being a function of previous values, in order to have a basis for comparison with the leading indicator models to be discussed later. Two methods were used to analyze the data: FORTRAN programs that were written while studying Box and Jenkins techniques (referred to as TSP) aided in model identification and residual analysis, and a standard time series analysis package in BMDP was utilized to fine-tune models and forecast future values. The TSP programs employed various subroutines from the IMSL library.

Initially the simple and partial autocorrelations were examined for significant lags or a recognizable pattern such as a damped exponential or a sine wave. The TSP programs generated plots of both the simple and partial autocorrelations. These are shown in Figures 1a and 1b. The two standard error band was estimated as:

$$2 \text{ SE Band} = \pm \frac{2}{\sqrt{n}}$$

where n is the number of observations in the time series.

The simple autocorrelation plot might be construed as either a linearly decreasing function indicating nonstationarity or a very long sine wave where only a small portion of the wave is plotted. The partial autocorrelation plot has a significant autocorrelation at lags 1 and 15. This could be an autoregressive process of order 1, assuming that the significance at lag 15 can be attributed to spurious

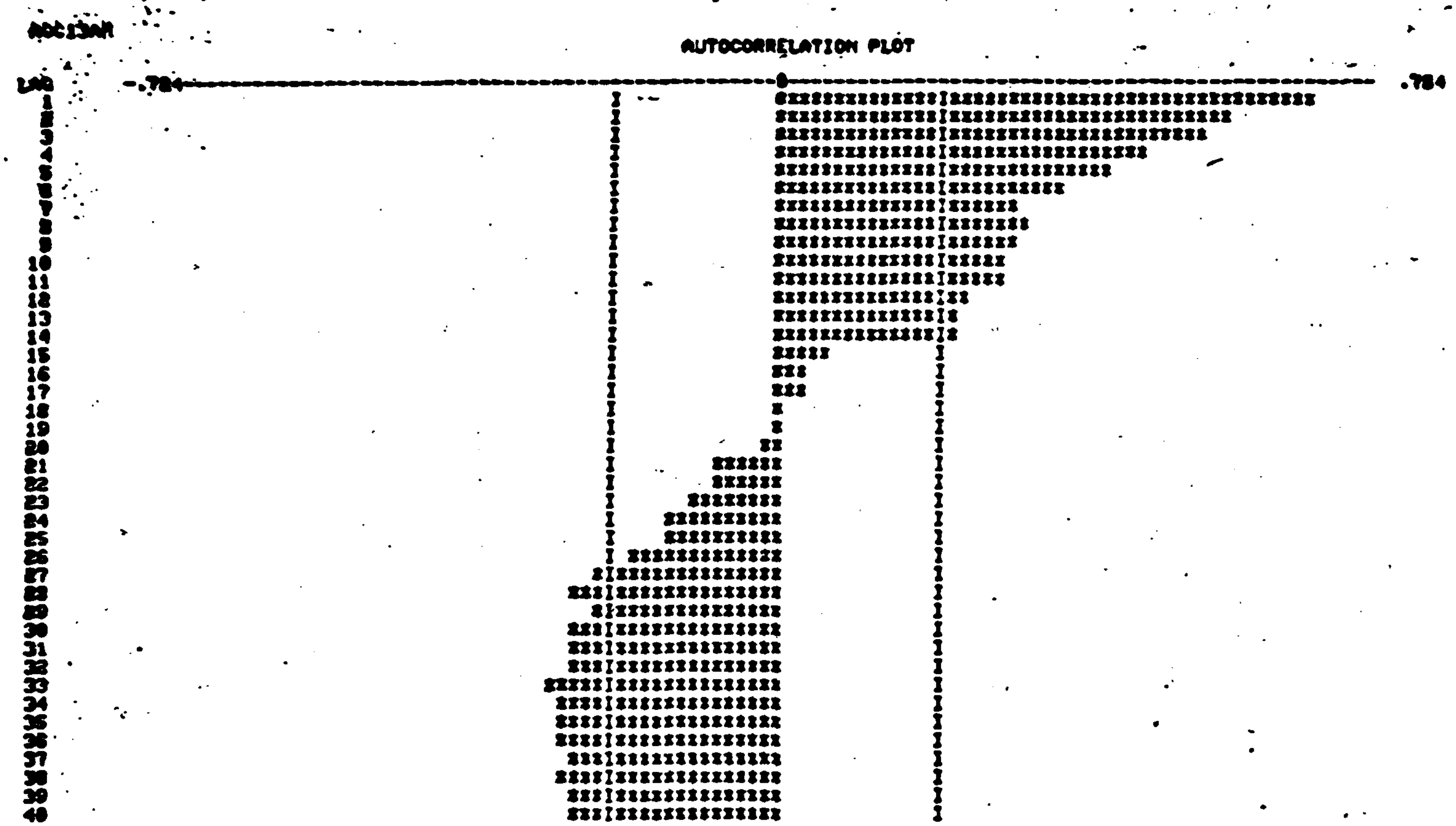
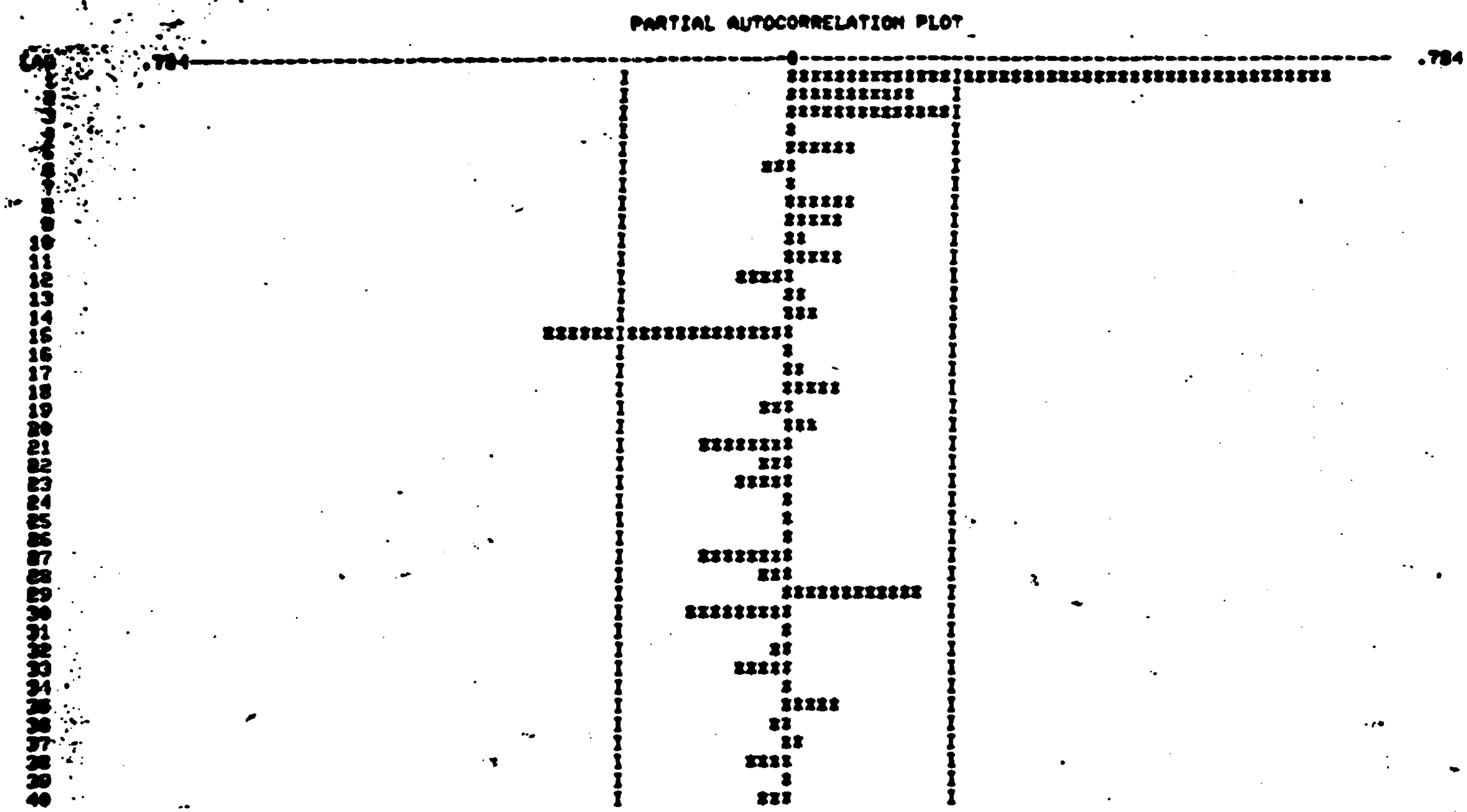


Figure 1a
Autocorrelation Plot of ACC13AM



FIRST LINE VAR(R(K)),SECOND LINE STD(R(K))

1	2	3	4	5	6	7	8	9	10
.018802	.028381	.030988	.036578	.037883	.038789	.037890	.034340	.034107	.034279
.137120	.168466	.176033	.191253	.194635	.196946	.194139	.185311	.184680	.185146

Figure 1b

Partial Autocorrelation Plot of ACC13AM

AD-A124 845 FACTORS INFLUENCING ARMY ACCESSIONS(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF ENGINEERING K M KALINICH ET AL. DEC 82 AFIT/GOR/OS/82D-7 2/4

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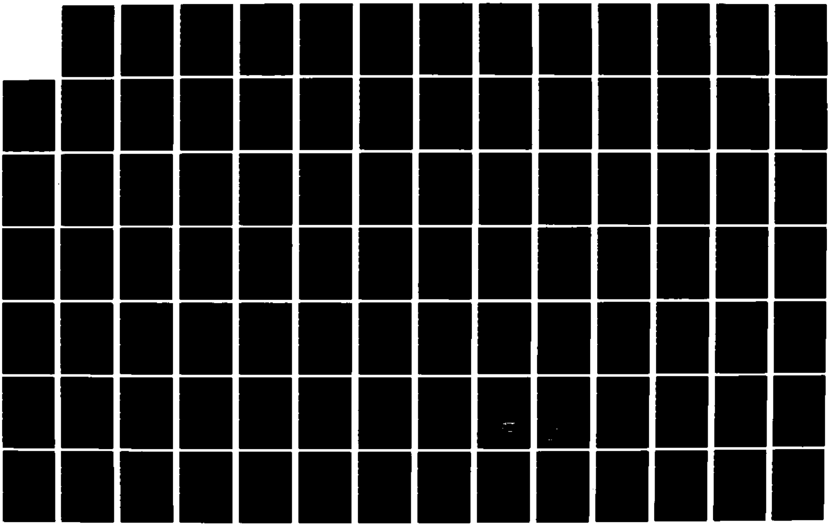

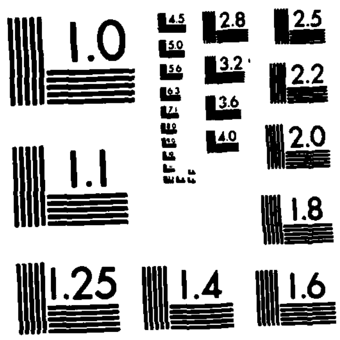

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

movement. Before any model was chosen additional techniques were used in model identification.

In order to analyze the periodogram for significance, the average of the intensity values is calculated to compare all intensity values for significance. This is done by using Table 7.1.2 in Fuller (Ref 8:284) to find the appropriate multiple (based on number of ordinates and the desired confidence level). The average intensity times the multiple (hereafter referred to as periodogram multiple) is computed and compared with all intenisty values. The average was approximately 2,421,741 and the periodogram multiple for a 40-value periodogram at the 95 percent confidence level is 6.295. Therefore any intensity value over 15,244,860 is significant. The only intensity value greater than the computed statistic (15,244,860) is at a period of 81 (Appendix D-1). This does not indicate a period of 81 but hints that the full period of the data has not yet been completed in the 81 data points.

Another tool used in model identification was developed by H.L. Gray, G. Kelly, and D. McIntire (Ref 9). This technique utilizes the R and S array method to aid in ARIMA model identification. By recognizing certain patterns in these arrays the p, d, and q (auto regressive, number of differences, and moving average) operators can be easily identified in the ARIMA model.

Using this methodology, the R and S arrays (at low and high frequency) were examined (Appendix D-2). The low

frequency values of the S array in Column 1 are all very close to -2 thus also indicating a possible nonstationarity in the data and the need to non-seasonally difference the data once to remove this nonstationarity. This was accomplished using the TSP programs as in earlier analysis.

For the differenced data, there were no significant simple autocorrelations, although there were several borderline cases (Appendix D-3). The only significant partial autocorrelation was at lag two, indicating that the differenced data might be modelled by an AR(2) process. Analysis of the periodogram of the differenced data, using the same periodogram multiple as before, indicated that any value greater than 5.7 million is significant at the 95 percent confidence level. There were no such values, thus there are no significant periods to be modelled out of the differenced data (Appendix D-3).

The R and S arrays for the differenced data indicated several possible models: ARMA (2,6), ARMA (4,2), and AR(6), all of which seemed to be an overfit of the simple AR(2) model. Appendix D-4 is a listing of the autocorrelation plots, periodogram values, and the R and S arrays for the differenced data. At this point, the BMDP time series package was used to help identify the model and perform various adequacy checks. Since our initial thought was that the process, once differenced, was autoregressive of order two, the data was differenced and modelled as AR(2).

Coefficients were estimated for the autoregressive parameters by the conditional least squares method and by backcasting. The coefficients for both the AR(1) and AR(2) terms were statistically significant. The residuals were estimated using these coefficients and then the residual series was examined for adequacy of the fit of the proposed model. If the model is adequate the residual series would not exhibit any significant simple or partial autocorrelations. The residual series from the ARI(2,1) model had no significant simple autocorrelations (but large at lag 14) and one significant partial autocorrelation at lag 14. For a listing of BMDP output for this model see Appendix D-5.

The foregoing results can be taken in two ways. When working at a 95 percent level of confidence in 100 lags one might expect 5 to be significant but still have an adequate model, or as in this case in 20 lags one might expect 1 significant autocorrelation. Taking this point of view one would accept this model as being adequate and the model for differenced data would be:

$$Z_t = -.2763Z_{t-1} - .3269Z_{t-2} + a_t$$

where a_t represents a white noise residual and Z_t are the various values of the differenced data at time t. The mean of this process was determined to not be statistically significant so it is not in the equation. Since Z_t are differenced data, the equation for undifferenced data is

$$(1-B)\ (1 + .2763B + .3269B^2)\ X_t = a_t$$

or

$$X_t = .7237X_{t-1} - .0506X_{t-2} + .3269X_{t-3} + a_t \quad (7\text{-}1)$$

However, if the significance of the partial autocorrelation at lag 14 is deemed to be unacceptable, an autoregressive term of order 14 would be added to the model and the residual series checked for any remaining significant simple or partial autocorrelations. This was done using BMDP. See Appendix D-6 for a listing of output for this model. Once again all coefficients were statistically significant and none of the partial or simple autocorrelations were significant for the residual series. Thus a multiplicative seasonal ARIMA $(2,1,0)*(1,0,0)_{14}$ is also tentatively considered as an adequate model with the following equation:

$$Z_t = -.1835Z_{t-1} - .2429Z_{t-2} + .2670Z_{t-14} + a_t$$

where Z_t once again represents differenced data and a_t the white noise residual series. Thus the equation for undifferenced data is:

$$(1-B)\ (1 + .1835B + .2429B^2 - .2670B^{14})\ X_t = a_t$$

or

$$X_t = .8165X_{t-1} - .0594X_{t-2} + .2429X_{t-3} + .2670X_{t-14}$$
$$- .2670X_{t-15} + a_t \quad (7\text{-}2)$$

Before deciding on a final model for accessions there are two other checks to apply to the model. The Portmanteau lack of fit test (Ref 1:290-293) looks at the autocorrelations of the residuals taken as a whole rather than considering them individually.

Computing $Q = n \sum_{k=1}^{K} r_k^2\,(\hat{a})$

where n is the number of data points (minus the number of times differenced), K is the number of autocorrelations considered and $r_k^2\ (\hat{a})$ is the estimated value of the residual series autocorrelation at lag k. Q has an approximate X^2 distribution with (K-p-q) degrees of freedom, with p and q representing the number of components in the model average components of the model. If the model is inappropriate, the average value of Q will be inflated or larger than the X^2 statistic with (K-p-q) degrees of freedom at the desired confidence level.

For the two models considered, the Portmanteau results at a 95 percent confidence level were:

ARI (2,1)	ARIMA $(2,1,0)*(1,0,0)_{14}$
Q = 24.298	Q = 25.723
$X^2_{(38)} \cong 53.36$	$X^2_{(37)} \cong 52.16$

therefore both models given by equations (7-1) and (7-2) are adequate.

A final model check is a graph of the cumulative periodogram (Ref 1:294-297). This is done to insure that the model has accounted for all periodic components. The plots of the cumulative periodograms for both models are at Figure 2 and 3 along with the autocorrelations of the residual series used in the calculation of the Portmanteau Q value. Both plots were within the acceptable Kolomogorov-Smirnov limits. Additionally, both plots were almost identical in nature. This is expected because the ARIMA $(2,1,0)*(1,0,0)_{14}$ is an overfit of the ARIMA (2,1,0) model.

Since both models were adequate fits for the data, the BMDP Time Series package was used to predict future results for both models as well as for predicting values at various points in time throughout the data (Appendix E-9). In analyzing these forecasts, one might conclude the ARIMA $(2,1,0)*(1,0,0)_{14}$ model is better because it has a smaller standard error band. However, in much the same manner one would expect a higher r^2 in regression analysis when an additional variable is entered, a tighter standard error band is expected when a time series model is overfit. In most instances, the first one or two predictions are quite accurate but, as one proceeds further away from the start point, the predictions as compared to actual values showed marked differences. This helps to point out the reason for using the leading indicator technique. When one has a model that uses predicted values to predict values further into the future, the standard error band will get enormously wide. What is hoped for in the leading indicator portion is to find an independent variable that leads accession rates. This allows for use of actual current values of the independent variable to predict future values of the dependent variable.

Leading Indicator Modelling (Phase II)

Unemployment Rates as the Input Variable. Many studies have been done attempting to relate fluctuations in the economy, particularly the unemployment rate, to accessions. Recently Dale and Gilroy (Ref 5) used a time series analysis technique to show a correlation between unemployment rate

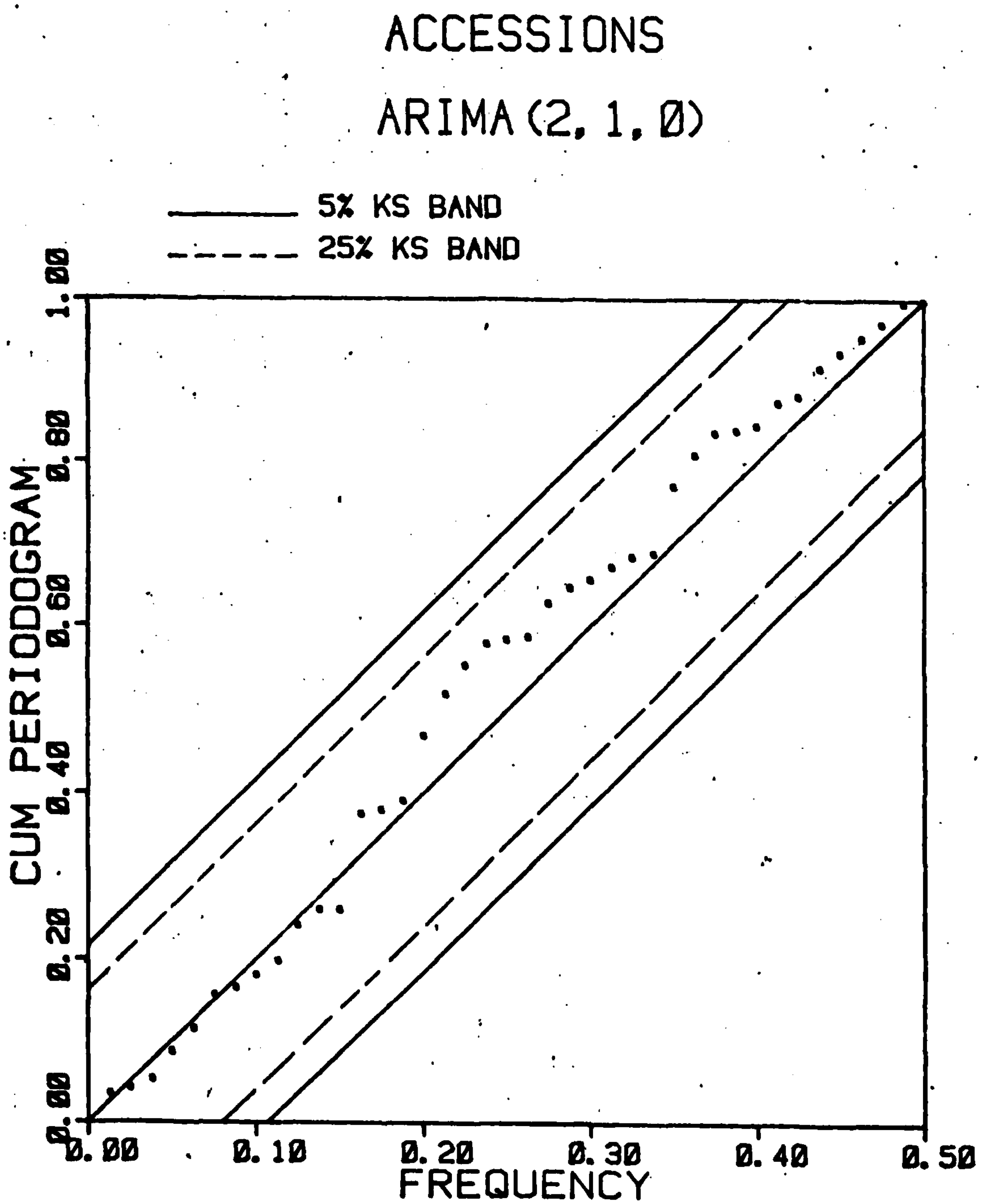

Figure 2
Cumulative Periodogram for ARI(2,1) ACC13AM Model

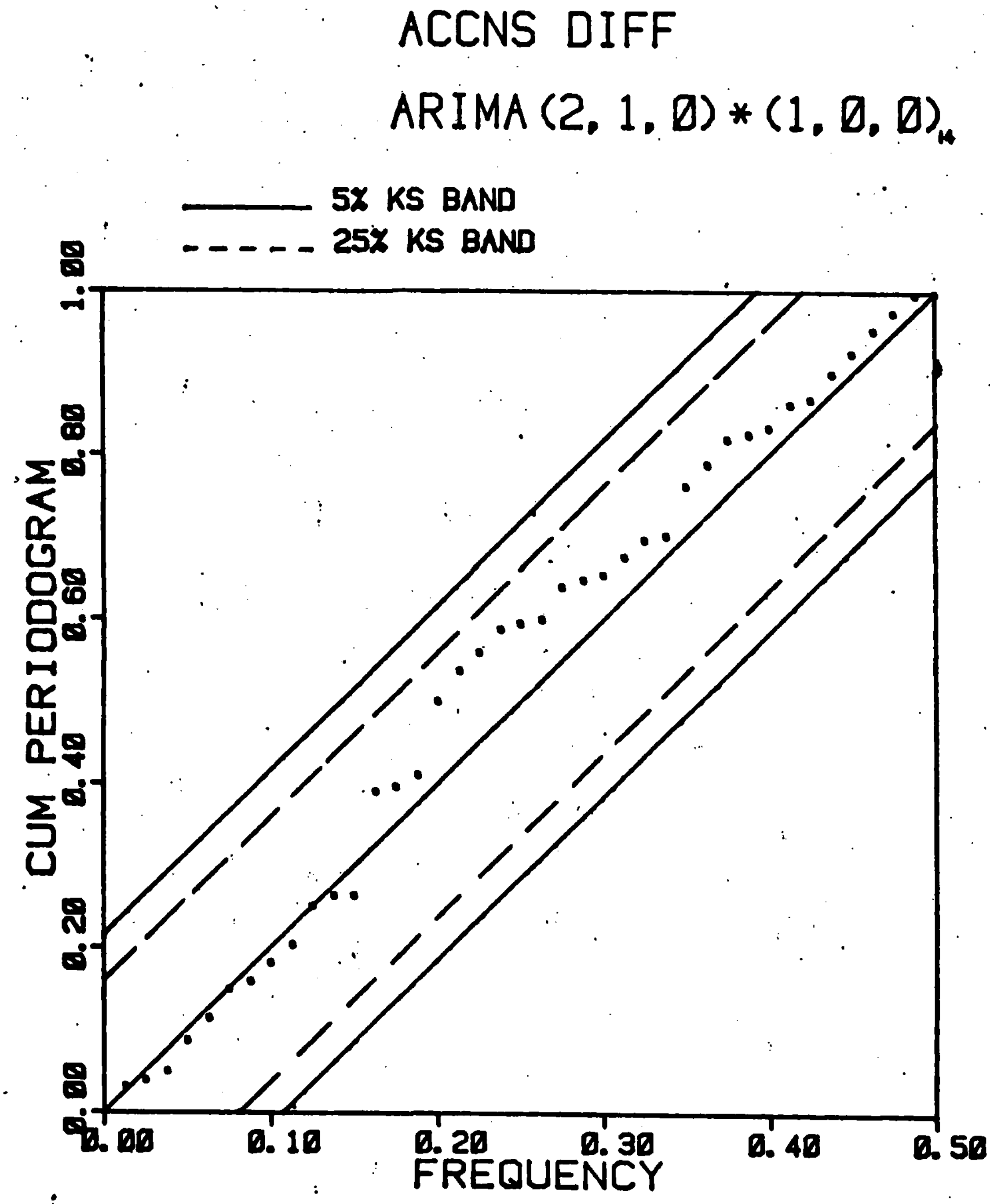

Figure 3

Cumulative Periodogram for ARIMA(2,1,0)*(1,0,0)$_{14}$

and accessions. They used regression analysis with various lags on unemployment rate as independent variables. Their dependent variable value, Male HSG Mental Category I-IIIA Accessions, are the same DMDC data used in this analysis. This phase of the analysis will extend the Dale and Gilroy study by using Box-Jenkins leading indicator techniques.

Hopefully the forecasts on accessions rates can be considerably improved by associating these forecasts with another variable. This will be the case if changes in accession rates are anticipated by changes in unemployment rates. The first step in the leading indicator technique is to model the input variable, unemployment rates. TSP was used in model identification. The simple autocorrelation plot of the raw data appeared (Appendix E-1) to be either the middle of a long sine wave or a linearly decreasing function. This pattern is recognized as indicating nonstationarity in the data which necessitates differencing. The periodogram implies the frequency of the data might be longer than the 81 data points utilized. The S-Array at low frequency tended to the value two in column one, thus indicating that one root of the polynomial function that explains the data lies on the unit circle, which also suggests a need to difference the data before proceeding with the modelling.

After differencing, the unemployment rate data was analyzed for significant autocorrelations. There were no simple or partial autocorrelations significant thus indicating that all that is needed is to difference unemployment

rate data and the pattern of the remaining residuals is white noise. However, closer examination shows that there are several large, though not significant, simple and partial autocorrelations (Appendix E-2). Knowing that the 2 standard error band is an approximation (Ref 1:32-34), it was decided to further model the data. The average intensity from the periodogram was .129. This multiplied by the periodogram multiple of 6.295, for 40 periodogram values at α = .05 gives a value of approximately .81. There are no intensities greater than this value therefore seasonal differencing is not necessary. The S-arrays of the differenced data initially identified an AR(1), AR(2) and ARMA (4,2) as possible models. Appendix E-2 is a listing of the appropriate TSP computer output. BMDP was used to estimate the coefficient of the autoregressive parameter, calculate residuals and check the residual series for significant autocorrelations. As expected there were no significant simple or partial autocorrelations and the estimated AR(1) coefficient of .1332 was not statistically significant (T values all less than 2.0). Next the ARMA (4,2) model was investigated. Remembering that any of these models are an overfit to an ARIMA (0,1,0), one does not expect to find any significant autocorrelations and there were none. Once again none of the estimated coefficients were statistically significant. These models were therefore rejected. Next the AR(2) was investigated. There were no significant autocorrelations. The Portmanteau Q value was well within the

acceptable region and the plot of the cumulative periodogram values shows no model deficiencies. However, the estimated coefficients were not statistically significant and this model was also rejected.

Since differencing the data yielded no significant autocorrelations, it was attempted to model the unemployment rate data without differencing. First, an AR(1) model was applied to the data. The AR(1) coefficient was significant and there were no remaining significant autocorrelations in the residual series. The Portmanteau Q statistic was calculated (22.8) and compared to a chi-squared table value with 39 degrees of freedom and this model appeared to be adequate. Second, an AR(2) model was applied to the data. Both AR coefficients were significant and there were no significant autocorrelations in the residual sequence. The Portmanteau Q was calculated (21.5) and compared to a X^2 table value with 38 degrees of freedom and this model appeared to be adequate. The cumulative periodogram values for these two models were plotted with no values outside the K-S limits, and a visual comparison with the AR(1) plot clearly indicates a better fit on the AR(2) model.

A comparison of the adequate models is shown in Table 3 below. See also Appendix E-3 for pertinent output in model identification for unemployment rates.

Table IV

Comparison of Adequate Models for Unemployment Rates

Model ARIMA	A (1,0,0)	B (2,0,0)
Coefficients (T-values)	AR(1) .9940 (1273)	AR(1) 1.1322 (1071.85)
		AR(2) -.1363 (29.18)
ACF/PACF	No significant Lags (NSL)	NSL
Q	22.8	21.5
Significance (α)	.025	.015
Cumulative-Periodogram Plot	Within K-S Limits	Very tight about the center line
	Always above center line	

The ARIMA (2,0,0) model (Model B) was selected as the best model for unemployment rates because it has a smaller Q value, its cumulative periodogram plot is visually better than Model A and it has a higher significance level. Therefore the resulting AR(2) model for unemployment rates is:

$$(1 - 1.1322B + .1363B^2)\ Z_t = a_t$$

or

$$X_t = 1.1322X_{t-1} - .1363X_{t-2} + a_t \qquad (7\text{-}3)$$

where X_t is unemployment rate at time t and a_t is the associated white noise residual.

The next phase in the leading indicator modelling process is to filter the output series (accessions) by the ARIMA model for the input (unemployment rates) series.

In other words, the same exact formula as (7-3) above is implied to accessions:

$$Y_t = 1.1322Y_{t-1} - .1363Y_{t-2} + b_t \qquad (7-4)$$

The residuals (b_t) in this model are not likely to be white noise as they (a_t) are in the input model. The residuals from the filtered output are then checked for cross correlations with the white noise residuals from the input model. The cross correlation plot aids in the identification of the functional form of the transfer function components. Additionally the simple and partial autocorrelation function of the filtered output residuals are examined for any additional significant ARIMA components to be included in the transfer function.

These steps were applied to accession rates using BMDP. The resulting cross correlation and autocorrelation plots are at Figures 4, 5a and 5b. The cross correlation plot showed no significant positive lags. However, if the 2 S.E. band were tightened slightly there might be significant cross correlations at lags 1, 3, 7 and 8. Thus, from the sample cross correlations between the prewhitened input (unemployment rate) series and the filtered accession rates the preliminary indications were a transfer function of the following form:

$$Y_t = (U_1B^1 + U_2B^3 + U_3B^7 + U_4B^8)\, X_t + E_t$$

where Y_t and X_t are the respective output and input series with their means removed. E_t is a white noise residual.

1

PLOT OF SERIAL CORRELATION

```
             -1.0 -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                      I
 -20  -.121                     +  IIII     +
 -19   .215                     +     IIIIII+
 -18  -.291                    I+IIIIII     +
 -17   .216                     +     IIIIII+
 -16  -.022                     +    II     +
 -15   .059                     +     II    +
 -14  -.066                     +   III     +
 -13  -.012                     +     I     +
 -12  -.028                     +    II     +
 -11   .161                     +     IIIII +
 -10  -.040                     +    II     +
  -9   .059                     +     II    +
  -8   .152                     +     IIIII +
  -7  -.203                     +IIIIII     +
  -6   .129                     +     IIII  +
  -5  -.083                     +   III     +
  -4   .006                     +     I     +
  -3   .155                     +     IIIII +
  -2   .105                     +     IIII  +
  -1  -.204                     +IIIIII     +
   0   .074                     +     III   +
   1   .179                     +     IIIII +
   2   .029                     +     II    +
   3   .145                     +     IIIII +
   4   .021                     +     II    +
   5   .017                     +     I     +
   6   .002                     +     I     +
   7  -.142                     + IIIII     +
   8   .141                     +     IIIII +
   9   .033                     +     II    +
  10  -.004                     +     I     +
  11  -.129                     +  IIII     +
  12   .098                     +     III   +
  13   .038                     +     II    +
  14   .050                     +     II    +
  15   .040                     +     II    +
  16  -.040                     +    II     +
  17  -.029                     +    II     +
  18   .035                     +     II    +
  19  -.015                     +     I     +
  20   .109                     +     IIII  +
```

Figure 4
Cross Correlation Plot of Filtered Unemployment Rate Model

AUTOCORRELATIONS

```
  1- 12    -.37 -.15  .12 -.08  .07  .04 -.10  .03  .05 -.09  .11 -.05
 ST.E.      .11  .13  .13  .13  .13  .13  .13  .13  .13  .13  .13  .13

 13- 20    -.06  .35 -.27 -.06  .05  .04 -.02  .06
 ST.E.      .13  .13  .14  .15  .15  .15  .15  .15
```

PLOT OF SERIAL CORRELATION

```
         -1.0  -.8  -.6  -.4  -.2  .0   .2   .4   .6   .8  1.0
LAG  CORR. +----+----+----+----+----+----+----+----+----+----+
                                    I
  1  -.369                IIII+IIIII    +
  2  -.152                  +  IIIII     +
  3   .116                  +      IIII  +
  4  -.082                  +    III     +
  5   .066                  +      III   +
  6   .036                  +      II    +
  7  -.100                  +   IIII     +
  8   .030                  +      II    +
  9   .046                  +      II    +
 10  -.080                  +    III     +
 11   .112                  +      IIII  +
 12  -.047                 +      II       +
 13  -.061                 +     III       +
 14   .352                 +       IIIIIII+II
 15  -.274                  IIIIIIII       +
 16  -.059                 +      II       +
 17   .050                 +       II      +
 18   .038                 +       II      +
 19  -.023                 +      II       +
 20   .062                 +       III     +
```

Figure 5a

Simple Autocorrelation Plot of Filtered Unemployment Rate Model

```
PARTIAL AUTOCORRELATIONS

  1- 12     -.37 -.33 -.11 -.16 -.02  .04 -.05 -.03  .02 -.07  .06  .01
 ST.E.       .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11

 13- 20     -.04  .30  .07  0.0 -.11  .02 -.07  .05
 ST.E.       .11  .11  .11  .11  .11  .11  .11  .11


PLOT OF SERIAL CORRELATION

             -1.0 -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                       I
  1   -.369                    IIII+IIIII    +
  2   -.333                     III+IIIII    +
  3   -.107                          + IIII    +
  4   -.157                          +IIIII    +
  5   -.018                          +    I    +
  6    .035                          +    II   +
  7   -.049                          +   II    +
  8   -.031                          +   II    +
  9    .018                          +    I    +
 10   -.071                          +  III    +
 11    .064                          +    III  +
 12    .006                          +    I    +
 13   -.035                          +   II    +
 14    .303                          +    IIIII+IIIII
 15    .070                          +    III  +
 16    .005                          +    I    +
 17   -.114                          + IIII    +
 18    .016                          +    I    +
 19   -.074                          +  III    +
 20    .054                          +    II   +
```

Figure 5b .

Partial Autocorrelation Plot of Filtered Unemployment Rate Model

A full explanation of the derivation of a transfer function model is found in Reference 1. Additionally, the simple autocorrelation function is significant at lags 1 and 14 suggesting a possible MA(1) component in the model while the partial autocorrelation function is significant at lags 1, 2 and 14 suggesting a possible AR(2) component in the model. Attempts to model out these significant lags by using the moving average of order 1 failed.

Fine-tuning the transfer function model by adding an AR(2) model along with the U coefficients at lags 1, 3, 7 and 8 had a remaining significant partial autocorrelation at lag 6. Thus, an autoregressive term of order 6 was added to the model and the model was reestimated, residuals calculated and autocorrelation plots of the residual series examined. The coefficient for the second order autoregressive term and the U coefficient at lag 3 were not significant so that they were dropped from the model. The remaining components, AR orders (1,6) and UP orders (1,7,8) were estimated and the resulting BMDP output is at Appendix E-4.

A summary of the model follows:

Type	Variable	Order	Coefficient Estimate	T-Ratio
AR	ACC13AM	1	.5288	5.96
AR	ACC13AM	6	.4605	5.25
UP	Unemp	1	702.6	4.88
UP	Unemp	7	-441.6	1.91
UP	Unemp	8	378.9	1.64

Both the simple and partial autocorrelation plots are within the two standard error bands. These results lead one to the conclusion that this is a tentative transfer function model. This is almost exactly what we were looking for, a variable that leads accession rates. This model says the important unemployment rates to predict current accession rates are one, seven and eight months back from the time you are trying to predict. It was hoped that by dropping the first lag and only estimating the U order coefficient at lags 7 and 8 the model would still be adequate. This was done, however the 7th U order coefficient was no longer statistically significant, thus, it was dropped. The transfer function model was reevaluated only with AR (1,6) and UP(8) components. In the resulting model the lag at 8 was determined to no longer be statistically significant. Therefore we returned to the AR (1,6), UP (1,7,8) as a tentative transfer function model. The resulting transfer function is:

$$Y_t + (U_1B^1 + U_2B^7 + U_3B^8)\ X_t + \frac{1}{1-\Phi_1B^1-\Phi_2B^6}\ a_t$$

or

$$Y_t = 702.9X_{t-1} - 441.6X_{t-7} + 378.9X_{t-8} + \frac{}{1-.5288B^1-.4605B^6}\ a_t$$

Diagnostic Checking

Before accepting the above transfer function as an adequate representation of the system modelled, autocorrelation and cross correlation checks should be applied (Ref 1: 393-397). Both the Q and S criterion are derived in the

same manner as the Portmanteau Q statistic discussed earlier. The first 24 lags of the residual autocorrelation are used in the computation of the Q criterion:

$$Q = m \sum_{K=1}^{24} r^2_{\hat{a}\hat{a}}(K)$$

where m is the actual number of residuals available for the computation:

$$Q = 71\ (.2752) \cong 12.44$$

Comparison of Q = 12.44 with the X^2 tabled value for K-p-q degrees of freedom (where p and q are from the noise model) shows no grounds for questioning the model's adequacy at an α level of .005.

Using the first 36 values of the cross correlations between the output residuals and the prewhitened input residuals yields the S criterion:

$$S = m \sum_{K=0}^{35} r^2_{a\hat{a}}(K) = 71(.157994) \cong 11.218$$

Comparison of S with the X^2 tabled value with (K + 1) - (r + s + 1) degrees of freedom at the .005 level again shows no grounds for questioning the model's adequacy.

Forecasting Under Transfer Function Models

In order to forecast accession rates, it is necessary to provide forecasts of the unemployment rates. This is done using BMDP. Once the unemployment rates are forecasted, the transfer function is used to predict accession rates. A BMDP listing of this output is at Appendix E-5.

A comparison of these results with the results of modelling accession rates alone (Phase I) shows that the forecasts for short lead times under the leading indicator model have a much narrower error band thus increasing the accuracy of the forecast. These results are shown in Table V.

Table V

Comparison of LI Model and Simple Time Series Forecasts

Period Ahead ℓ	Forecasts Accessions Along ARI(2,1)	SE	Forecasts Leading Indicator	SE-LI
1	4900	599	4777	519
2	4745	740	5045	626
3	4852	792	5969	688
4	4873	878	4802	735
5	4837	966	4494	775
6	4849	1032	4731	811

Model Enhancing

If the reader refers to Appendix E-4 the simple and partial autocorrelations at lag 1 are both large but not significant. An effort was made to reduce the size of this autocorrelation hopefully reducing even further the standard error band on future predictions. Since there were already first and second order autoregressive components in the transfer function, a moving average component of order one (MA(1)) was added to the model. Coefficients were estimated, residuals calculated and the residual series checked for significant simple or partial autocorrelations. Appendix E-6 is a listing of BMDP output for this model.

The model is summarized as follows:

Variable	Type	Order	Coefficient Estimate	T-Ratio
ACC	MA	1	.3169	1.91
ACC	AR	1	.6832	6.64
ACC	AR	6	.3114	3.07
Unemp	UP	1	701.92	5.26
Unemp	UP	7	-493.81	2.04
Unemp	UP	8	426.99	1.93

All of the coefficients were significant at the .05 level and there were no significant simple or partial autocorrelations.

The resulting transfer function model is:

$$Y_t = 701.92X_{t-1} - 493.81X_{t-7} + 426.99X_{t-8} + \frac{(1-.3169B)}{1-.6832B-.3114B^6} a_t$$

Since this is an overfit of a previously calculated model there is no doubt about its adequacy. A comparison between the forecasts of the two models is shown in Table VI.

Table VI

Comparison of Unemployment Rates Leading Indicator Models

Period Ahead ℓ	Model 1 AR(1,6) UP(1,7,8) Forecast	SE	Model 2 AR(1,6) MA(1) UP(1,7,8) Forecast	SE	Actual
1	4777	519	4612	523.6	
2	5045	626	4912	596.5	
3	4969	688	4822	640.1	
4	4802	735	4696	673.4	
5	4494	775	4419	702.2	
6	4731	811	4708	728.1	

It should be noted that in all cases Model 2's predictions are less than Model 1's and the desired effect of tightening the SE band happened at all predictions except the first.

However, when considering a 2 SE band about Model 1's first prediction it can be said with approximately 95 percent confidence that the true value of the accessions for the next month will lie between 3739 and 5815.

The conclusion reached from this point is that, regardless of the fact that both transfer function models are adequate representations of the data and they have tightened the 2 SE band when compared to the model from Phase I, the models have too wide a standard error band, even on the first prediction, to be models that Army planners can use to predict future accession rates.

<u>Producer Price Index as Input Variable</u>. Since unemployment rates failed to produce a usable leading indicator model, a different type of variable was chosen to model with accessions. The producer price index (PPI) much like the consumer price index is a measure of inflation. PPI was chosen as the independent variable in the leading indicator technique. Since the same modelling process was used as with unemployment rates, only the final results will be discussed in this section. The producer price index was successfully modelled as follows:

$$(1-B)(1-.2985B^3 - .4965B^{12})\ X_t = (1+.8789B + .3169B^5)\ a_t$$

or

$$\frac{(1-.2985B^3 + .2985B^4 - .4965B^{12} + .4965B^{13})}{(1 + .8789B + .3169B^5)} X_t = a_t$$

This equation was used to filter accessions and there were three transfer function models that were found to successfully model the data. They are:

1. $$Y_t = (73.3B^5-70.5B^6)\ X_t + \frac{(1 + .9072B)}{(1-.5949B^2-.2420B^6)} a_t$$

   or

   $$Y_t = 73.3X_{t-5} - 70.5X_{t-6} + \frac{(1 + .9072B)}{(1-.5949B^2-.2410B^6)} a_t$$

2. $$Y_t = X_t + \frac{a_t}{(1-.7531B-.1119B^6)}$$

3. $$Y_t = (65.5 - 65.2B)\ X_t + \frac{a_t}{(1-.7202B - .1522B^2)}$$

   or

   $$Y_t = 65.5X_t - 65.1X_{t-1} + \frac{a_t}{(1-.7202B - .1522B^2)}$$

All three of these models have some coefficients that are not statistically significant at the .05 probability level. This causes the standard error bands on the forecasts to be even wider than those in the unemployment model. Additionally, the only model that allows you to look ahead with current values of the PPI is the first and the lag coefficients on X_{t-5} and X_{t-6} are not significant. The other models use values of X_t to predict Y_t. This defeats the purpose of modelling with a leading indicator.

Predictions were made using the three transfer function models and the results are in Table VII.

Table VII

Comparison of PPI Leading Indicator Models

Period Ahead ℓ	Transfer Fn. 1 Forecast	SE	Transfer Fn. 2 Forecast	SE	Transfer Fn. 3 Forecast	SE
1	4936	614	4673	619	4874	629
2	4739	819	4462	762	4716	771
3	4870	948	4248	867	4732	833
4	4724	1037	4127	941	4600	862
5	4798	1100	3947	995	4522	877
6	4691	1149	3821	1037	4640	884

The best two standard error band for the first prediction is using transfer function 1 with a band of $\pm$ 1228. For a list of BMDP output see Appendix E-7. Once again this is not a model that would be readily adopted by Army planners.

Prime Rate as Input Variable. The Prime Rate was also chosen as the input variable in the leading indicator model with accession rates remaining the output variable. As with the PPI, only the final results will be discussed.

The prime rate yielded two models:

$$(1-B)(1-.3053B^{14})\ X_t = (1+.6640B - .3625B^3 - .5574B^4)\ a_t$$

or

$$(1-B-.3053B^{14} + .3053B^{15})\ X_t = (1 + .6640B - .3625B^3 - .5574B^4)\ a_t$$

or

$$\frac{(1-B-.3053B^{14} + .3053B^{15})}{(1 + .6640B - .3625B^3 - .5574B^4)}\ X_t = a_t$$

and the second model:

$$(1-B)(1-.6760B + .3685B^2 + .3756B^4 - .3729B^5 + .2573B^{10}) \cdot X_t = a_t$$

or

$$(1 - 1.6760B - 1.0445B^2 - .3685B^3 + .3756B^4 - .7485B^5 + .8421B^6 - .4692B^7 + .2573B^{10} - .2573B^{11})\, X_t = a_t$$

or

$$X_t - 1.6760X_{t-1} - 1.0445X_{t-2} - .3685X_{t-3} + .3756X_{t-4} - .7485X_{t-5} + .8421X_{t-6} - .4692X_{t-7} + .2573X_{t-10} - .2573X_{t-11} = a_t$$

where in both models X_t is the input variable, prime rate, and a_t is a white noise residual.

These models were used to filter accession rates and they resulted in the corresponding transfer functions:

$$Y_t = X_t + \frac{1}{(1 - .7502B - .1048B^6)}\, e_t$$

and

$$Y_t = X_t + \frac{(1 + .3455B^6)}{(1 - .7177B)}\, e_t$$

Neither of these transfer function models are usable because they use values of the input to predict the same time frame's accession. BMDP computer listings for prime rate Leading Indicator Modelling are at Appendix E-8. A summary of the two models' predictions for accessions rates is at Table VIII.

Table VIII

Comparison of Prime Rate Leading Indicator Models

Period Ahead	Model 1		Model 2	
	Forecast	SE	Forecast	SE
1	4674	613	4720	606
2	4356	766	4322	744
3	4167	840	4176	805
4	3970	879	3751	834
5	3828	900	3582	848
6	3788	912	3669	856

Once again the two standard error bands are too wide on the first predictions for either of these models to be considered acceptable.

Results and Conclusions

The objective of modelling using a leading indicator is to find a variable that leads accession rates and to provide a better predictive model than by simply modelling accession rates as a time series. Leading indicator models were developed where accessions lagged behind unemployment rates at 1, 7 and 8 months and behind Producer Price Index at 5 and 6 months. The unemployment model provided a tighter two standard error band than by modelling accessions as a time series. However, in all cases the standard error bands were too wide to provide a realistically usable model for Army planners. The conclusion is that unemployment rates, the producer price index and the prime rate are not reasonable input variables for a leading indicator model. There are many reasons for this; the basic assumption underlying all time series modelling is that the basic

stochastic process inherent in the data is not changing. Currently, unemployment rates are skyrocketing and the prime rate is falling; there may be forces at work that lead these variables which our models fail to account for. However, we are attempting to model nationwide accession rates with nationwide unemployment rates. This may be the wrong way to model accessions. People are affected in various parts of the country by any number of influences to join the Army. The unemployment rate is one such influence. In the South the unemployment rate has been running much lower than in the industrial North East and Mid West. One would expect unemployment rates to have a different effect on accessions based on the <u>local</u> unemployment rate rather than on the national rate.

Recommendation for Future Research

We are led to the obvious conclusion that this subject area needs to be disaggregated and studied on a regional basis. Additionally, the input variables should be considered as output variables and leading indicators for these variables (especially unemployment rates) should be sought. There are a multitude of economy related variables to be found so that continuing this effort with other input variables should not be a difficult task. Finally, there seems to be problems in the predictions for the input variables (they all seem to be going in the wrong direction from the actual predicted values). It is recommended that this subject be studied by applying the frequency domain approach.

VIII. Summary

Research Objectives

The objectives of this research effort were as follows:

1. Enhance the USAREC Enlistment Prediction Model.

2. Study accessions in an attempt to understand what factors influence them.

3. Build a discriminant function to predict whether potential accessions will join the Army or other services.

4. Conduct time series analysis on accessions using Box and Jenkins techniques.

5. Develop leading indicator models to predict accessions based on the following input variables: unemployment rates, producer price index, and the prime rate.

6. Provide to ARI and USAREC useable computer programs to accomplish the above.

Accomplishments

The following are the major accomplishments of this thesis:

1. Enhanced Enlistment Prediction Model.

The predictive ability of the regression model used by USAREC in projecting accessions has been significantly improved through the incorporation of new relationships among the USAREC variables. Running this EPM model is the first phase in USAREC's designation of recruiting missions for each of the 57 District Recruiting Commands (DRC). This enhancement allows USAREC to formulate more accurate quarterly

projections of accession rates and will make all steps after it more exact with the goal of assigning a more precise and feasible recruiting mission to the DRC's.

A comparison of the adjusted R^2 from the USAREC model and the enhanced model is shown below:

Region	USAREC Model	Enhanced Model
NE	.75220	.76185
SE	.73807	.76889
SW	.68286	.71546
MW	.62862	.63073
WEST	.75133	.81231

2. <u>District Recruiting Command (DRC) reorganization of MEPS file and its merger with the USAREC file</u>.

One usable byproduct resulting from this thesis study is the development of a FORTRAN program that will recode state and county codes on the MEPS file into DRC codes. ARI-PERI-RP has been very interested in having this capability in order that they might be able to perform analysis of the MEPS file based on recruiting regions and districts. An additional FORTRAN program allows researchers to enhance this DRC analysis capability by merging the information on the MEPS file with the data from the USAREC files. Thus, the researchers at ARI-PERI-RP will be able to organize their MEPS file investigation by DRC codes; and as a corollary, a bridge is provided for the exchange of information between ARI and USAREC.

3. Multivariate analysis techniques for examining the variables in the merged MEPS/USAREC (MU) file.

Based on the profile analysis done on the MEPS file and the merged MU file, several characteristic variables were selected and analyzed by Recruiting Region and DRC using both factor and discriminant analysis. The variables that emerged from the profile analysis and the multivariate procedures and output formats used in this study can be employed in the continuing research efforts of both ARI and USAREC.

4. Time Series Analysis of economic variables associated with recruiting.

The results of this study's time series analysis provides USAREC with new tools for examining accession rates based on certain economic indicator variables. Box-Jenkins time series analysis techniques were applied to the USAREC data. In addition, unique procedures and programs were specifically developed in this thesis effort for use on several economic variables available to USAREC. Armed with these programs and procedures, USAREC will be able to carry out extended research into the economic and demographic variables affecting recruiting and accessions.

The objective of the time series analysis was to find variables that lead accession rates. This was done in the unemployment model; unemployment rates were found to lead accessions, i.e., coefficients were significant, by one, seven, and eight months. Also, the producer price index leads accessions by 5 and 6 months. However, there may be a

problem with the leading indicator models since the standard error bands about the predicted values of accessions were large. In this case it will be necessary to see how well the predictions fare over the next six months.

Recommendations for Further Analysis

1. Extend time period.

The results of this thesis effort open doors to several areas of investigation in the area of Army recruiting. The chief recommendation is that the many procedures which are outlined in this study can and should be applied against existing data bases and variables over an extended time period rather than the narrow bands of time which were covered in this thesis. From an extended interval of time, more accurate accession indicators and predictive coefficients can be developed. Since the MEPS sample was limited to one year of data, many USAREC variables did not have much variance in only four quarters. Thus, shifts in such variables as unemployment, percentage of Army recruiters by DRC, and number of blacks available cannot yield solid predictive models when based on only four quarters in the MU file analysis.

2. Add variables to data base and extend studies to Regions and DRC's.

Now that a method is available for ARI to examine the MEPS data using DRC codes, other demographic and economic variables can be obtained from the Bureau of the Census and merged with the MEPS data by DRC. Further expansion of the

variables and analysis in this area can now focus on specific Recruiting Regions and DRC's rather than be limited to the relatively meaningless MEPS ID codes.

3. <u>Perform multivariate analyses on other service components</u>.

The factor and discriminant analysis procedures developed for the study of the MU file can be employed in further research of the variables affecting the National Guard and Reserve components. The data sample of the MEPS file, although very large at 48,520 records, did not have enough records to perform detailed analysis at the DRC level. Much can be learned from applying the multivariate analysis procedures to the other components as was applied to the Regular forces.

4. <u>Extend factor analysis with correlation analysis</u>.

The next step in factor analysis of the MU file would be to assign standardized names to the discovered factors and then run correlation analysis such as the SPSS subroutine PEARSON CORR with the various factors against a dependent variable such as the Army variable. The results should demonstrate how closely the new factors predict the Army variable, that is, whether an individual is "oriented" to join the Army based on the characteristics of the new factors.

5. <u>Perform discriminant analysis on entire data base and study variables' "target" groups</u>.

The next step in discriminant analysis of the MU

file would be to use the entire data base rather than just a sample to develop accurate unstandardized canonical correlation coefficients by DRC. The coefficients can then be used to determine if certain "target" groups are more likely to join the Army or another branch of service. This is beneficial in those cases when a certain "target" group of the population is sought by the Army, such as for instance high school graduate, male hispanics from a given DRC. In this example, by knowing the current unemployment rate, median income, percentage of Army recruiters, etc., one can use the unstandardized coefficients to predict whether or not the "target" group will join the Army over another branch. It could be that decreasing the percentage of Army recruiters only slightly in the equation will have a strong impact on the "target" group deciding to join another branch instead. Several "target" populations with widely varying attributes can be run against this model to determine their likelihoods of joining the Army. Such techniques could be employed when a given Region or DRC is planning an advertising campaign in a given DRC to beef up accessions, e.g., it <u>may</u> be found that the best advertising for the Army should be based on the income variable rather than the unemployment variable in a given DRC.

6. <u>Add variables to discriminant model</u>.

Other variables can also be added to the discriminant model to enhance its predictive capabilities, such as the addition of amount of advertising dollars spent by the

various services. The user of these procedures should be cautious not to approach the use of these variables as competitive tools to draw desired "high quality" enlistments away from the other services. Rather, the aim is to attract the same caliber of personnel into the Army as is enjoyed by the other branches, and to avoid expending scarce resources on the wrong "target" groups.

7. Consider other methods of preparing the data base for further analysis.

Similar analysis as developed in this study can be performed on a different mode of MEPS/USAREC file organization and file merging. One suggestion referred to in Chapter V, Data Base Preparation, is to develop summary totals within the MEPS file by DRC and quarter based on tallies of the attribute variables. For instance, one may tally the number of individuals with AFQT scores over 50 by service by DRC by quarter, or tally a cross combination of several characteristics. These MEPS file tallies could then be merged with the USAREC data base to form a new summary file to be used in further analysis. This merging can use the same FORTRAN routine for state/county to DRC recoding that was employed in the original MU file development.

8. Consider enhancing EPM.

There are logical extensions to the enhancement of the USAREC EPM. In Dale and Gilroy's study (Ref 5), military pay was found to have a significant relationship with accessions. Inclusion of wage differential variable or a percent

annual pay raise variable in the model might further enhance the quality of its output.

9. <u>Perform time series analysis at regional level using leading indicators and spectral analysis</u>.

In the time series analysis, we are led to the obvious conclusion that this subject area needs to be disaggregated and studied on a regional basis. Additionally the input variables should be considered as output variables, and leading indicators for these variables (especially unemployment rates) should be sought after. There is a wealth of available economy-related variables to be considered, so that continuing this effort with other input variables should not be a difficult task. Finally, there seems to be a problem in the predictions for the input variables; they all seem to be in error in the same direction from the actual values. It is recommended that this subject be studied by applying the time domain approach.

<u>Compendium</u>

The overall importance of this thesis effort is that it provides a variety of tools for the study of the many aspects of Army Recruiting. In summary, the tools developed and employed are:

1. State and county recode to DRC,

2. Merge of MEPS and USAREC data bases,

3. Profile of MEPS and USAREC variables important to recruiting,

4. Multivariate analysis of MEPS and USAREC variables,

5. Regression enhancement of the Enlistment Prediction Model,

6. Box-Jenkins Time Series Analysis of USAREC variables, and

7. Unique time series analysis procedures for analysis of leading economic indicators to accession projections.

Thus, this thesis provides many analysis techniques which are applied against data bases that are common to both ARI and USAREC. As a result, researchers examining recruitment and accessions now have an expanded assemblage of tools that can be used to address the many issues facing Army Recruiting.

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Appendix A-1

Sample of USAREC Data Base and Input Format for the Associated Variables

82024K	759	896	1986	232	77	216	153	54789386	629	47516462	108	342	225155	133	134	55	35	195
82025A	17	1595	6117	434	140	625	481	88787422	1191	97617323	710	722	498 76	177	349	49	89	271
82025B	103	769	2390	215	86	488	396119913431		950	79616144	134	660	481126	163	292	51	85	187
82025C	131	1469	4003	433	128	634	492120628395		1519	125616303	261	909	637 82	253	387	61	120	283
82025D	207	838	2530	223	82	365	264120690394		823	67516283	89	518	388141	190	240	37	64	176
82025E	438	922	1644	220	79	336	281100807413		735	60814453	25	515	372110	195	230	54	64	176
82025F	45	1300	3518	332	124	622	532160799401		1377	113818190	407	860	651 84	233	342	69	137	307
82025H	267	1125	1859	270	107	450	373129646413		1036	87315419	145	629	477107	170	273	73	66	179
82025I	363	1192	3687	350	111	499	408155707395		1099	91818190	109	733	534134	220	314	65	101	283
82025J	434	1272	2322	358	123	434	331	98593402	985	74715224	104	681	479 94	150	306	58	92	233
82025K	733	1317	3038	381	119	416	313	76689414	1006	78915261	26	638	452 89	217	288	62	66	211
82025L	2445	1162	2546	303	113	384	289	65731419	916	73113702	35	590	406131	167	288	86	67	177
82025M	261	1160	2971	324	94	407	322110812425		926	78616849	147	540	382111	197	257	55	67	188
82025N	595	1327	4563	356	121	625	491	94666424	1281	102516092	261	772	536127	223	374	94	118	282
82026A	89	1118	1915	308	87	398	280	77796351	795	59117122	226	563	332 62	97	265	69	62	563
82026E	5731	214	604	114	38	177	158	69831474	341	30517467	13	219	170110	53	70	25	48	200
82026F	250	1599	3880	532	155	756	575	85612366	1439	112917122	340	872	607103	123	415	71	791158	
82026G	1213	645	2304	218	69	384	281	76669374	807	62515474	50	551	369106	163	254	58	81	252
82026H	690	782	1896	166	69	350	248122630406		783	58215747	29	589	359 61	133	271	71	56	281
82026I	1316	886	2261	324	106	542	397	91713281	1204	91317041	86	737	491 96	160	365	61	97	602
82026J	4001	794	2116	261	63	282	193	92641286	634	48414698	13	413	265 85	90	215	63	43	191
82026K	366	1288	1915	344	104	446	325	92836337	1016	77617122	64	569	363 94	117	305	62	76	689
82026L	858	960	1681	291	114	457	337	94668403	1013	80517068	48	696	432 78	113	342	97	92	428

VARIABLE: TIME,QTR,RGN,DRC,AREA,QMA,REACT,HSSNR,RCTFS,NPSMACC,HSDGMACC,
UNEMP,RCTREX,RCTRSPCT,DODNPS,DODHSDG,INCOME,BMA,
TOTCON,HSGCON,PROPEN,AIDES,CAT13AM,FSTOTACC,NPSFACC,DRCADV

INPUT FORMAT FIXED(F4.0,T4,2F1.0,T5,A2,4F5.0,F4.0,F6.0,F5.0,2F3.1,
F3.3,2F6.0,2F5.0,2F4.0,F3.1,F4.1,4F4.0)

Appendix A-2

Male High School Graduate Mental Category I-IIIA Army Accession Rates (October 1975 to July 1982)

MALE HSG MENTAL CATEGORY I-IIIA ARMY ACCESSIONS

7510	6246
7511	4064
7512	3757
7601	4601
7602	4096
7603	3897
7604	2440
7605	2427
7606	3197
7607	2912
7608	2942
7609	2704
7610	2651
7611	3485
7612	5927
7701	2384
7702	2237
7703	2358
7704	1849
7705	1718
7706	2157
7707	2152
7708	2432
7709	1894
7710	1535
7711	1751
7712	1531
7801	1813
7802	1607
7803	1552
7804	1125
7805	974
7806	1694
7807	1539
7808	1623
7809	1297
7810	1379
7811	1465
7812	1536
7901	2285
7902	1860
7903	1255
7904	1487
7905	2188
7906	2096
7907	1998
7908	1998
7910	1513
7911	1620
7912	1742
8001	1650
8002	2488
8003	2504
8004	2340
8005	2203
8006	2172
8007	2398
8008	2915
8009	2653
8010	2375
8011	2495
8012	2323
8101	2500
8102	3113
8103	3229
8104	2565
8105	2649
8106	2322
8107	2998
8108	3509
8109	3117
8110	3093
8111	3083
8112	3232
8201	3630
8202	4455
8203	4454
8204	4933
8205	4396
8206	4455
8207	5097

Appendix A-3

Unemployment Rates (October 1975 to July 1982)

UNEMPLOYMENT RATES

7510	8.6
7511	8.5
7512	8.3
7601	7.8
7602	7.6
7603	7.5
7604	7.5
7605	7.3
7606	7.5
7607	7.5
7608	7.9
7609	7.8
7610	7.9
7611	8.0
7612	7.8
7701	7.3
7702	7.5
7703	7.3
7704	7.0
7705	6.9
7706	7.1
7707	6.9
7708	7.1
7709	6.8
7710	6.5
7711	6.7
7712	6.4
7801	6.3
7802	6.1
7803	6.2
7804	6.0
7805	6.1
7806	5.7
7807	6.2
7808	5.9
7809	5.9
7810	5.8
7811	5.8
7812	5.9
7901	5.8
7902	5.7
7903	5.7
7904	5.8
7905	5.8
7906	5.6
7907	5.7
7908	6.0
7910	5.8
7911	5.9
7912	5.8
8001	5.9
8002	6.2
8003	6.0
8004	6.2
8005	7.0
8006	7.8
8007	7.7
8002	7.8
8009	7.6
8010	7.4
8011	7.6
8012	7.5
8101	7.4
8102	7.4
8103	7.3
8104	7.3
8105	7.3
8106	7.6
8107	7.3
8108	7.0
8109	7.2
8110	7.6
8111	8.0
8112	8.3
8201	8.8
8202	8.5
8203	8.8
8204	9.0
8205	9.4
8206	9.5
8207	9.5

Appendix A-4

Producer Price Index (October 1975 to July 1982)

PRODUCER PRICE INDEX

7510	178.9
7511	178.2
7512	178.7
7601	179.3
7602	179.3
7603	179.6
7604	181.3
7605	181.8
7606	183.1
7607	184.3
7608	183.7
7609	184.7
7610	185.2
7611	185.6
7612	187.1
7701	188.1
7702	190.2
7703	192.0
7704	194.4
7705	195.2
7706	194.5
7707	194.8
7708	194.6
7709	195.3
7710	196.3
7711	197.1
7712	198.2
7801	200.1
7802	202.1
7803	203.8
7804	206.4
7805	207.9
7806	209.4
7807	210.6
7808	210.4
7809	212.3
7810	214.9
7811	215.7
7812	217.5
7901	220.8
7902	224.1
7903	226.7
7904	230.0
7905	232.0
7906	233.5
7907	236.6
7908	238.1
7910	241.7
7911	245.6
7912	247.2
8001	249.7
8002	254.9
8003	260.2
8004	261.9
8005	262.8
8006	264.2
8007	265.6
8008	265.8
8009	273.1
8010	274.1
8011	277.0
8012	279.1
8101	280.8
8102	284.8
8103	287.6
8104	290.3
8105	293.4
8106	294.1
8107	294.8
8108	296.2
8109	296.4
8110	295.7
8111	296.1
8112	295.5
8201	295.8
8202	298.3
8203	298.5
8204	297.9
8205	297.9
8206	298.6
8207	299.4

Appendix A-5

Prime Rate (October 1975 to July 1982)

PRIME RATE

7510	7.96
7511	7.53
7512	7.36
7601	7.2
7602	6.75
7603	6.75
7604	6.75
7605	6.75
7606	7.2
7607	7.25
7608	7.01
7609	7.0
7610	6.73
7611	6.5
7612	6.35
7701	6.25
7702	6.25
7703	6.25
7704	6.25
7705	6.41
7706	6.75
7707	6.75
7708	6.83
7709	7.13
7710	7.52
7711	7.75
7712	7.75
7801	7.93
7802	8.0
7803	8.0
7804	8.0
7805	8.27
7806	8.63
7807	9.0
7808	9.01
7809	9.41
7810	9.94
7811	10.94
7812	11.55
7901	11.75
7902	11.75
7903	11.75
7904	11.75
7905	11.75
7906	11.65
7907	11.54
7908	11.91
7910	12.9
7911	14.39
7912	15.55
8001	15.3
8002	15.25
8003	15.63
8004	18.31
8005	19.77
8006	16.57
8007	12.63
8008	11.48

8009	11.12
8010	12.23
8011	13.79
8012	16.06
8121	22.35
8122	22.16
8123	15.43
8124	18.05
8125	17.15
8126	15.61
8127	22.03
8128	22.39
8129	22.5
8110	22.08
8111	18.45
8112	16.84
8201	15.75
8202	15.75
8203	16.56
8204	16.5
8205	16.5
8206	16.5
8207	16.5

Appendix A-6

Listing of Time Series Program (TSP)

```
      PROGRAM TSARS(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE1)
      COMMON AC(51)
      COMMON LW
      COMMON NAC
      INTEGER NAC,NPAC
      CHARACTER IWK(80),IWHAT
      CHARACTER TITLE*20
      REAL R(40,40),S(40,40),Z(368),ACV(50),PACV(50)
      REAL WK(50)
      CHARACTER A(-50:50)
      CHARACTER B*1
      REAL N
      REAL CC
      CC=0.0
      IFLG=1
      PRINT *,'HOW LONG IS THE TIME SERIES?'
      READ(5,*) LZ
   89 REWIND 1
      LW=LZ
        DO 1 I=1,LZ
         READ(1,*) Z(I)
    1 CONTINUE
   88 PRINT*,' ENTER TITLE '
      READ(5,102) TITLE
      N=0.0
      CC=0.0
  102 FORMAT(A20)
      PRINT *,'DO YOU WANT TO DIFFERENCE OR TRANSFORM (Y/N)?'
      READ(5,100) IWHAT
100   FORMAT(1A1)
      IF(IWHAT.EQ.'Y') THEN
      PRINT *,'WHAT IS THE ORDER OF THE NON-SEASONAL DIFFERENCE:ID1)=0 '
         READ(5,*) ID1
      PRINT *,'WHAT IS THE ORDER OF THE SEASONAL DIFFERENCING:ID2)=0 '
         READ(5,*) ID2
         PRINT*,'TRANSFORMATION COEFF: IP=0 (LN),IP>0(Z(I)=Z(I)**IP)'
         READ(5,*)IP
         PRINT*,'LENGTH OF SEASON: IS)=0'
         READ(5,*)IS
         LZA=LW
         CALL FTRDIF(ID1,ID2,IP,IS,LZA,Z,SHIFT,LW,IER)
         WRITE (7,'(A50)')' DIFFERENCED DATA'
         WRITE (7,'(1X,F20.10)')(Z(I),I=1,LW)
      ENDIF
      NAC=LW/2
      IF (NAC.GT.45) NAC=45
      NPAC=LW/2
      IF (NPAC.GT.45) NPAC=45
C
      CALL FTAUTO(Z,LW,NAC,NPAC,7,AMEAN,VAR,ACV,AC,PACV,WK)
```

```
      WRITE(6,102) TITLE
       WRITE(7,103) TITLE
  103 FORMAT(1H1,1X,A20)
       PRINT*,' MEAN = ',AMEAN,' VARIANCE = ',VAR
       PRINT*,'   '
       WRITE(7,101) AMEAN,VAR
101    FORMAT(/,' AMEAN =',F12.6,'  VARIANCE = ',F12.6,/)
       PRINT*,'DO YOU WANT TO SEE THE FTAUTO OUTPUT (Y/N)?'
       READ(5,100) IWHAT
       IF (IWHAT.EQ.'Y') THEN
       PRINT*,' LAG  AUTOCOVARIANCE AUTOCORRELATION PARTIAL AUTOCORRELATI
      1ON'
       IF (NAC.GT.45) NAC=45
       X1=2.0/(SQRT(REAL(LW)))
       DO 2 I=1,NAC
          IF (ABS(AC(I)).GT.ABS(CC)) CC=AC(I)
          IF (ABS(AC(I)).GT.ABS(X1)) THEN
            B='*'
              ELSE
              B=' '
          ENDIF
           PRINT 7,I,ACV(I),AC(I),B,PACV(I)
           WRITE (7,7)I,ACV(I),AC(I),B,PACV(I)
2      CONTINUE
       PRINT *,'    '
       WRITE (*,500) 'THE APPROXIMATED 2 S.E. BAND IS +/-',X1
500    FORMAT (1X,A35,F10.4)
       PRINT *,'    '
       PRINT *,'*-DENOTES AUTOCORRELATION OUTSIDE 2 S.E. BAND'
       PRINT *,' CLEAR SCREEN, THEN INPUT ANY CHARACTER FOR AUTOCORRELATI
      1ON PLOT'
       READ (*,2100) B
2100   FORMAT(A1)
       PRINT *,'    '
       PRINT *,'    '
       PRINT *,TITLE
       PRINT *,'                                                        A
      1UTOCORRELATION PLOT'
       PRINT *,'    '
       IF (X1.GT.ABS(CC)) CC=X1
       N=ABS(CC)*1.1
       X1=ABS(X1)*50/N
       WRITE (*,501) 'LAG',ABS(CC)*(-1.1),'-----------------------------
      1--------------------0-----------------------------------------
      1-----',ABS(CC)*1.1
501    FORMAT (1X,A3,5X,F6.3,A101,F6.3)
       DO 200 I=1,NAC
       DO 201 J=-50,50
          A(J)=' '
201    CONTINUE
```

```
      CC=AC(I)*50.0/N
       CC=CC+.5
       ICC=INT(CC)
       IF (ICC.LT.0.) THEN
          DO 600 J=-50,ICC-1
             A(J)=' '
600       CONTINUE
          DO 601 J=1,50
             A(J)=' '
601       CONTINUE
          ELSE
             IF (ICC.EQ.0.) THEN
                DO 602 J=-50,-1
                   A(J)=' '
602             CONTINUE
                DO 603 J=1,50
                   A(J)=' '
603             CONTINUE
                ELSE
                   IF (ICC.GT.0.) THEN
                   DO 604 J=-50,-1
                   A(J)=' '
 604                 CONTINUE
                   DO 605 J=ICC+1,50
                   A(J)=' '
605                CONTINUE
                   ENDIF
             ENDIF
       ENDIF
       A(-X1-.5)='I'
       A(X1+.5)='I'
       WRITE (*,2000) I,(A(J),J=-50,50)
2000   FORMAT (1X,I3,11X,101A1)
200    CONTINUE
       PRINT *,'    '
7      FORMAT(1X,I2,6X,F12.6,1X,F12.6,1A,1X,F12.6)
       PRINT *,' CLEAR SCREEN, THEN INPUT ANY CHARACTER FOR PARTIAL AUTOC
      1ORRELATION PLOT'
       READ (*,2100) B
       PRINT *,'    '
       PRINT *,'    '
       PRINT *,TITLE
       PRINT *,'                                                    PARTIA
      1L AUTOCORRELATION PLOT'
       PRINT *,'    '
       WRITE (*,1501)'LAG',N,'-----------------------------------------
      1-------0-----------------------------------------------',N
1501   FORMAT (1X,A3,5X,F6.3,A101,F6.3)
       DO 208 I=1,NAC
       DO 209 J=-50,50
```

```
         A(J)='*'
209   CONTINUE
      CC=PACV(I)*50.0/M
      CC=CC+.5
      ICC=INT(CC)
      IF (ICC.LT.0.) THEN
         DO 610 J=-50,ICC-1
            A(J)=' '
610      CONTINUE
         DO 611 J=1,50
            A(J)=' '
611      CONTINUE
         ELSE
            IF (ICC.EQ.0.) THEN
               DO 612 J=-50,-1
                  A(J)=' '
612            CONTINUE
               DO 613 J=1,50
                  A(J)=' '
613            CONTINUE
               ELSE
                  IF (ICC.GT.0.) THEN
                  DO 614 J=-50,-1
                  A(J)=' '
614               CONTINUE
                  DO 615 J=ICC+1,50
                  A(J)=' '
615               CONTINUE
                  ENDIF
            ENDIF
      ENDIF
      A(-X1-.5)='I'
      A(X1+.5)='I'
      WRITE (*,2000) I,(A(J),J=-50,50)
208   CONTINUE
      PRINT *,'    '

         IF(IFLG.EQ.1) CALL BARTLT
      ENDIF
C     FOURIER DECOMPOSITION
      PRINT*,' DO YOU WANT THE PERIODOGRAM?  '
      READ(5,100) IWHAT
      IF (IWHAT.EQ.'Y') CALL PGRAM(Z,LW)
      PRINT*,'  '

C     DO R AND S
C
      DO 4 I=51,2,-1
         AC(I)=AC(I-1)
4     CONTINUE
```

```
      AC(1)=1.0
      MXROW=40
      MROW=32
      IF (LW.LT.32) MROW=LW
      NEC=15
      IF (LW.LT.30) NEC=LW/2
      KOL=10
44    CONTINUE
      PRINT*,' ENTER THE VALUE OF IRHO (0:HIGH FREQ,-1:LOW)? '
      READ(5,*) IRHO
      IRS=0
      CALL RANDS(MXROW,MROW,NEC,KOL,IRHO,AC,R,S,IWK,IRS)
      PRINT*,' DO YOU WANT ANOTHER 4 AND S ARRAY?'
      READ(5,100) IWHAT
      IF (IWHAT.EQ.'Y') GO TO 44
      PRINT*,' DO YOU WANT THE D STATISTIC? '
      READ(5,100) IWHAT
 5489 IF (IWHAT.EQ.'Y') THEN
         PRINT*,' ENTER THE MAX AR ORDER  '
         READ(5,*) IP
         PRINT*,' ENTER THE MAX MA ORDER  '
         READ(5,*) IQ
         PRINT*,' DO YOU WANT TO SEE THE D STAT?'
         PRINT*,' 0=YES, 1=NO==>'
         READ(5,*) IPNT
         CALL DSTAT(MXROW,MROW,NEC,R,S,IP,IQ,IPNT)
      ENDIF
      PRINT*,' DO YOU WANT ANOTHER D STATISTIC?  '
      READ(5,100) IWHAT
      IF (IWHAT.EQ.'Y') GOTO 5489
      PRINT*,' DO YOU WANT FTMXL?'
      READ(5,100) IWHAT
 5490 IF (IWHAT.EQ.'Y') CALL OURMXL(Z,LW)
      PRINT*,' DO YOU WANT ANOTHER FTMXL?'
      READ(5,100) IWHAT
      IF (IWHAT.EQ.'Y') GOTO5490
      PRINT*,' DO YOU WANT ANOTHER RUN?'
      READ(5,100) IWHAT
      IF (IWHAT.NE.'Y') STOP
      PRINT*,' WHICH DATA? 0=ORIGINAL, 1=CURRENT==>'
      READ(5,*) IANS
      IF (IANS.EQ.0) GOTO89
      IF (IANS.NE.0) GOTO88
      STOP
      END


      SUBROUTINE BARTLT
      REAL R(-10:60),VR(10),STD(10)
      INTEGER V
```

```
      COMMON AC(51)
       COMMON LW
       COMMON NAC
       DO 1 I=-10,0
          R(I)=0.0
1      CONTINUE
       DO 2 I=1,NAC
          R(I)=AC(I)
2      CONTINUE
       DO 3 I=NAC+1,60
          R(I)=0.0
3      CONTINUE
C      REMEMBER R(0)=1
       R(0)=1.0
C
C      BY BARTLETT'S APPROXIMATION, EQU 2.1.11
       DO 5 K=1,10
          X=0.0
          DO 6 V=0,NAC
             X=X+R(V)**2+R(V+K)*R(V-K)-4*R(K)*R(V)*R(V-K)+2*R(V)**2*R(K)*
      1*2
6         CONTINUE
          VR(K)=X/FLOAT(LW)
          STD(K)=SQRT(VR(K))
5      CONTINUE
       PRINT*,'  '
       PRINT*,'  '
       PRINT*,' FIRST LINE VAR(R(K)),SECOND LINE STD(R(K))'
       PRINT*,'  '
       PRINT*,'     1           2           3      ',
      1'     4           5           6      ',
      2'     7           8           9          10'
       PRINT 23,(VR(K),K=1,10)
       PRINT 23,(STD(K),K=1,10)
23     FORMAT(1X,10(F12.6))
       RETURN
       END
       SUBROUTINE RANDS(MXROW,MROW,NEC,KOL,IRHO,C,R,S,IWK,IRS)
       DIMENSION R(MXROW,1),S(MXROW,1),C(1),IWK(1)
       CHARACTER IWHAT
       DATA IBLK/1H /,ISTR/1H*/,IZRO/0/
       KOLM1=KOL-1
       DO 5 IC=1,KOL
       DO 5 IR=1,MROW
       R(IR,IC)=0.0
     5 S(IR,IC)=0.0
       MM=MROW-NEC
       DO 10 I=1,MM
       NECI=NEC+I
       S(NECI,1)=1.0
```

```
10 R(NECI,1)=C(I)
   DO 20 I=1,NEC
   NECI=NEC+2-I
   S(I,1)=1.0
20 R(I,1)=C(NECI)
   IF (IRHO .EQ. 0) GOTO40
   DO 30 I=1,NROW
   NECI=I-NEC-1
30 R(I,1)=R(I,1)*(-1)**(NECI)
40 J1=NROW
   DO 70 IC=2,KOL
   ICM1=IC-1
   J1=J1-1
   DO 60 IR=1,J1
   IRP1=IR+1
   IF (ABS(R(IR,ICM1)) .EQ. 0.0) GOTO50
   S(IR,IC)=S(IRP1,ICM1)*(R(IRP1,ICM1)/R(IR,ICM1)-1.0)
   GOTO60
50 S(IR,IC)=-S(IRP1,ICM1)
60 CONTINUE
   J1=J1-1
   DO 70 IR=1,J1
   IRP1=IR+1
70 R(IR,IC)=R(IRP1,ICM1)*(S(IRP1,IC)/S(IR,IC)-1.0)
   IF (IRS.NE.0) RETURN
75 FORMAT(A1)
   PRINT*,' THE 4 AND S ARRAYS HAVE BEEN CRUNCHED.'
   PRINT*,' DO YOU ACTUALLY WANT TO SEE THEM?'
   READ(5,75) IWHAT
   IF (IWHAT.NE.'Y') RETURN
   IF (IRHO .EQ. 0) GOTO80
   WRITE(6,200)
   WRITE(7,200)
   GOTO90
80 WRITE(6,210)
   WRITE(7,210)
90 WRITE(6,220) (IC,IC=1,KOL)
   WRITE(7,220) (IC,IC=1,KOL)
   DO 110 IR=1,NROW
   IRN=IR-NEC-1
   DO 100 IC=1,KOL
   IWK(IC)=IBLK
100 IF(IR.EQ.NEC+2-IC) IWK(IC)=ISTR
   WRITE(6,230) IRN,(R(IR,K),IWK(K),K=1,KOL)
   WRITE(7,230) IRN,(R(IR,K),IWK(K),K=1,KOL)
110   CONTINUE
   PRINT*,' TYPE ANY CHARACTER TO CONTINUE==>'
   READ(5,75) IWHAT
   WRITE(6,240) IZRO,(IC,IC=1,KOLM1)
   WRITE(7,240) IZRO,(IC,IC=1,KOLM1)
```

```
      DO 130 IR=1,MROW
       IRN=IR-NEC-1
       DO 120 IC=1,KOL
       IWK(IC)=IBLK
       IF (IR.EQ.NEC+2-IC) IWK(IC)=ISTR
  120  IF (IR.EQ.NEC+3-IC) IWK(IC)=ISTR
       WRITE(6,230) IRN,(S(IR,K),IWK(K),K=1,KOL)
       WRITE(7,230) IRN,(S(IR,K),IWK(K),K=1,KOL)
 130   CONTINUE
       RETURN
  200  FORMAT(//20X,27H( F(M) = ((-1)**M)*ACF(M) ))
  210  FORMAT(//25X,17H( F(M) = ACF(M) ))
  220  FORMAT(//30X,7HR-ARRAY//3H  K,11(9X,I2))
  230  FORMAT(2H (,I3,1H),11(1X,F9.4,A1))
  240  FORMAT(//30X,7HS-ARRAY//3H  K,11(9X,I2))
       END
       SUBROUTINE DSTAT(MXROW,MROW,NEC,R,S,IP,IQ,IPNT)
C
C .........................................................
C
C  DESCRIPTION OF PARAMETERS
C     MXROW - ROW DIMENSION OF R AND S ARRAYS IN CALLING PROGRAM
C       (INPUT)
C      MROW - NUMBER OF ROWS TO WHICH R AND S WERE CALCULATED.(INPUT)
C      NEC  - NUMBER OF ROWS OF NEGATIVE LAG IN R AND S ARRAYS(INPUT)
C         R - R ARRAY.  DIMENSIONED MXROW BY K IN CALLING PROGRAM,
C             WHERE K IS GREATER THAN OR EQUAL TO KOL.(INPUT)
C         S - S ARRAY.  DIMENSIONED AS R ARRAY IN CALLING PROGRAM.
C             (INPUT)
C        IP - (INPUT)MAXIMUM ORDER OF AUTOREGRESSION PERMITTED.
C             (OUTPUT) ORDER OF AUTOREGRESSION SELECTED.
C        IQ - (INPUT)MAXIMUM ORDER OF MOVING AVERAGE PERMITTED.
C             (OUTPUT) ORDER OF AUTOREGRESSION SELECTED.
C      IPNT - PRINT CONTROL PARAMETER (INPUT)
C             IPNT = 0    D STAT VALUES ARE PRINTED
C             IPNT NE 0 PRINTING IS SUPPRESSED.
C             WITH IPNT = 0 THE WRITE STATEMENTS REQUIRE THE INPUT VALUE
C             OF IQ TO BE LESS THAN TEN.
C
C
C     NOTE
C          NEC MUST BE GREATER THAN OR EQUAL TO IP+IQ+3, FOR IP AND
C       IQ THEIR INPUT VALUES.  FURTHERMOREMROW MUST BE GREATER THAN
C     OR EQUAL TO NEC+IP+IQ+4, FOR IP AND IQ EQUAL TO THEIR INPUT
C     VALUES.  IF (IP+1)*(IQ+1) IS GREATER THAN 50(WHERE IP AND IQ ARE
C      AT THEIR INPUT VALUES) THEN THE DIMENSION OF STAT MUST BE CHANGED
C      ACCORDINGLY.
C
C
C..............................................................
```

```
C
      DIMENSION R(NXROW,1),S(NXROW,1),STAT(50)
      DATA IPR/6/,IZRO/0/
      JPP=IP+1
      JQQ=IQ+1
      IQP=JPP*JQQ
      DO 40 I=1,JPP
      JP=I-1
      DO 40 J=1,JQQ
      JQ=J-1
      JK=JQQ*(I-1)+J
      ISUB2=NEC-JP+JQ+2
      ISUB1=ISUB2-1
      IP1=IP+1
      IN1=I-1
      BOT=(S(ISUB2,I)+S(ISUB1,IP1))**2
      IF(I.GT.1) GO TO 20
      DO 10 JI=1,3
      NECM=NEC-JP-JQ-JI+1
      NECP=NEC-JP+JQ+JI+1
10    BOT=BOT+R(NECM,I)**2+R(NECP,I)**2
      GO TO 35
20    ISUB3=ISUB2+1
      BOT=BOT/(S(ISUB3,IN1)+S(ISUB2,I))**2
      DO 30 JI=1,3
      NECM=NEC-JP-JQ-JI+1
      NECP=NEC-JP+JQ+JI+1
      NECM1=NECM+1
      NECP1=NECP+1
30    BOT=BOT+(R(NECM,I)/R(NECM1,IN1))**2+(R(NECP,I)/R(NECP1,IN1))**2
35    NEC0=NEC-JP-JQ
      NEC1=NEC0+1
      ARC=S(NEC0,IP1)/(BOT*S(NEC1,I))
40    STAT(JK)=ABS(ARC)
      INX=1
      XNX=STAT(1)
      DO 50 I=1,IQP
      IF(STAT(I).LT.XNX) GO TO 50
      INX=I
      XNX=STAT(I)
50    CONTINUE
      IP=(INX-1)/JQQ
      IQ=INX-(IP*JQQ)-1
      IF(IPNT.NE.0) RETURN
      WRITE(IPR,100)
      WRITE(7,100)
      JQQ=JQQ-1
      WRITE(7,110) IZRO,(I,I=1,JQQ)
      WRITE(IPR,110) IZRO,(I,I=1,JQQ)
      DO 60 J=1,JPP
```

```
      JM1=J-1
      IST=JM1*(JQQ+1)+1
      IEND=IST+JQQ
      WRITE(7,120) JM1,(STAT(I),I=IST,IEND)
60    WRITE(IPR,120) JM1,(STAT(I),I=IST,IEND)
      WRITE(7,130) IP,IQ
      WRITE(IPR,130) IP,IQ
      RETURN
100   FORMAT(///50X,'D STATISTIC'//29X,'ORDER OF MA')
110   FORMAT(' ORDER OF AR ',10(4X,I3,4X))
120   FORMAT(/4X,I2,6X,10(1X,E10.4))
130   FORMAT(/'  ORDER OF AUTOREGRESSION SELECTED  ',I4/
     C'  ORDER OF MOVING AVERAGE SELECTED  ',I4)
      END

      SUBROUTINE PGRAM(Z,LW)
      DIMENSION Z(368)
      REAL INTNCTY
      SINT=0.0
      PI=3.141592654
      PRINT*,' LW= ',LW
      PRINT*,' HOW MANY INTENSITY VALUES DO YOU WANT TO SEE?'
      PRINT*,' 0 = DEFAULT OF 45; N .LT. LW/2  **)'
      READ(5,*) N
      IF (N.EQ.0) N=45
      IF (N.GT.LW-1) N=45
      WRITE(6,78)
      WRITE(7,78)
      DO 20 I=1,N
         A=0.
         B=0.
         DO 10 IT=1,LW
            XARC=2.0*PI*FLOAT(I)*FLOAT(IT)/FLOAT(LW)
            A=A + Z(IT)*COS(XARC)
            B=B + Z(IT)*SIN(XARC)
10       CONTINUE
         A=2.*A/FLOAT(LW)
         B=2.*B/FLOAT(LW)
         INTNCTY=(FLOAT(LW)/2.)*(A*A + B*B)
         FQ=1.0*I/LW
         P=1.0/FQ
         WRITE(6,77) I,FQ,P,INTNCTY
         WRITE(7,77) I,FQ,P,INTNCTY
         SINT=SINT+INTNCTY
20    CONTINUE
77    FORMAT(1X,I3,2X,F5.3,2X,F7.3,2X,F10.3)
78    FORMAT(2X,'I',5X,'FQ',6X,'P',15X,'INTNCTY')
      PRINT*,'    '
      WRITE (6,2631) SINT/N
      WRITE (7,2631) SINT/N
```

```
2631  FORMAT(1X,'AVERAGE INTENSITY=',F20.10)
        RETURN
        END

        SUBROUTINE OURMIL(Z,LW)
        DIMENSION Z(368)
        INTEGER IND(8),IER
        REAL ARPS(6),PMAS(6),CR(24),AA(740)
        CHARACTER IWHAT
        IND(1)=LW
        IND(5)=500
        IND(6)=4
        IND(7)=0
        IND(8)=5
        PRINT*,' INPUT P, ORDER OF AR==>'
        READ(5,*) IP
        IND(2)=IP
        PRINT*,' INPUT Q, ORDER OF MA==>'
        READ(5,*) IQ
        IND(3)=IQ
        PRINT*,' INPUT D, ORDER OF DIFF==>'
        READ(5,*) ID
        IND(4)=ID
        PRINT*,' INPUT S, NUMBER OF SIGNIFICANT DIGITS REQUIRED==>'
        READ(5,*) IS
        IND(6)=IS
        PRINT*,' INPUT I, ITERATIONS REQUIRED W/O CHANGE TO DIGITS==>'
        READ(5,*) II
        IND(8)=II
        PRINT*,' DO YOU WANT TO INPUT ESTIMATIONS FOR THE COEFICIENTS?'
        READ(5,100) IWHAT
        IF(IWHAT.EQ.'Y') THEN
           IND(7)=1
           IF(IP.EQ.0) GO TO 152
           PRINT*,' INPUT AR ESTIMATES INDIVIDUALLY'
           DO 151 I=1,IP
              PRINT*,' ?'
              READ(5,*) ARPS(I)
 151       CONTINUE
 152       IF(IQ.EQ.0) GO TO 154
           PRINT*,' INPUT MA ESTIMATES INDIVIDUALLY'
           DO 153 I=1,IQ
              PRINT*,' ?'
              READ(5,*) PMAS(I)
 153       CONTINUE
 154    ENDIF
 100    FORMAT(1A1)
        CALL FTMXL(Z,IND,ARPS,PMAS,PMAC,WNV,CR,AA,IER)
 1001 FORMAT(/,' IND(5)= ',I3,'   IER= ',I3,/,
     .    ' WNV= ',F8.2,' PMAC= ',F12.6)
```

```
1002 FORMAT(/,' ARPS VALUES')
 1003 FORMAT(/,' PMAS VALUES')
      WRITE(6,1001) IND(5),IER,WNV,PMAC
      WRITE(7,1001) IND(5),IER,WNV,PMAC
      WRITE(6,1002)
      WRITE(7,1002)
      DO 20 I=1,IP
         WRITE(6,*) ARPS(I)
         WRITE(7,*) ARPS(I)
   20 CONTINUE
      WRITE(6,1003)
      WRITE(7,1003)
      DO 40 I=1,IQ
         WRITE(6,*) PMAS(I)
         WRITE(7,*) PMAS(I)
   40 CONTINUE
      RETURN
      END
```

Appendix A-7

Military Entrance Processing Station Codes

Status Code

A = Enlisted into military service.

B = Enlisted into military service and shipped to Basic Training location or duty station.

C = Shipped to Basic Training location or duty station.

D = Qualified but not yet enlisted into military service.

Entry Status

0 = Enlistment without delayed entry status. That is, Enlistment or induction into the active force without delay status, or reservist or National Guard (not delayed enlistment program enlistee) ordered to active duty or enlisted for active duty or reserve enlistment.

1 = Enlistment from delay program. That is, enlistment in active force from an authorized delay program to include returning delayed reservists.

2 = Reservist ordered from delay program. That is, reservists ordered to active duty from a delay status.

3 = Enlistment into delay program. That is, Enlistment into an authorized delay program, such as delayed enlistment programs.

Appendix B-1

USAREC Model

* * * * * * * * * * * * M U L T I P L E   R E G R E S S I O N * * * * * * * * * * * *

DEPENDENT VARIABLE..   CATTIAM

VARIABLE(S) ENTERED ON STEP NUMBER 17..   ADVCOST

MULTIPLE R	.86546	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.74903	REGRESSION	11.	1681531.05420	152866.45947	68.37130	.00
ADJUSTED R SQUARE	.73807	RESIDUAL	252.	563428.53658	2235.82793		
STD DEVIATION	47.28454	COEFF OF VARIABILITY	25.0 PCT				

------------------ VARIABLES IN THE EQUATION ------------------

VARIABLE	B	STD ERROR B	F / SIGNIFICANCE	BETA / ELASTICITY
REACT	-.10294526E-01	.22302516E-02	21.306564	-.2244568
			.000	-.15799
RCTRS	3.5475159	.28582695	154.04314	.6404053
			.000	1.00273
PROFEN	-8.4181485	1.2166973	47.713320	-.3132298
			.000	-.76532
INCOME	-.11275333E-01	.16704729E-02	45.559592	-.2693776
			.000	-.65901
Q1VAR	-76.129508	10.391446	53.672776	-.3676746
			.000	-.10969
Q3VAR	-49.216983	8.9447255	30.278232	-.2236748
			.000	-.05910
Q2VAR	-51.272081	9.6075096	28.460016	-.2416233
			.000	-.07367
URLADV	-.15573477	.44471696E-01	12.263200	-.1443251
			.001	-.13774
AIDES	.83.43426	.28454442	8.5174657	.1029902
			.004	.38450
DMA	.78640129E-01	.17797551E-01	19.523962	.1921759
			.000	.15113
ADVCOST	.25097451	.89763708E-01	7.9424034	.1400526
			.005	.12091
(CONSTANT)	294.02253	37.627332	61.059658	
			.000	

---------- VARIABLES NOT IN THE EQUATION ----------

VARIABLE	PARTIAL	TOLERANCE	F / SIGNIFICANCE
MSSNR	.01724	.14006	.74591682E-0
			.785
UNEMP	-.05918	.41526	.88222739
			.348
RCTREX	-.00236	.77001	.10663436E-0
			.974
DODRCR	-.00633	.09239	.10658402E-0
			.920
AREA	.01118	.31613	.31391831E-0
			.860
QMA	-.02293	.13235	.13237259
			.717

FINAL MODEL SE REGION USAREC MODEL

* M U L T I P L E   R E G R E S S I O N *

DEPENDENT VARIABLE.. CAT13AM
VARIABLE(S) ENTERED ON STEP NUMBER 10.. RCTRS

MULTIPLE R	.80103	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.64165	REGRESSION	10.	1323287.12425	132328.71243	49.24115	.00
ADJUSTED R SQUARE	.62862	RESIDUAL	275.	739024.02610	2687.36009		
STD DEVIATION	51.83975	COEFF OF VARIABILITY	21.4 PCT				

VARIABLES IN THE EQUATION

VARIABLE	B	STD ERROR B	F / SIGNIFICANCE	BETA / ELASTICITY
DOUNCR	.79933120	.15028579	28.267034	.5467656
			0	.42597
G1VAR	-148.44620	10.835168	187.70114	-.7785526
			0	-.16697
G2VAR	-108.29175	10.380135	108.65621	-.5674834
			0	-.12171
G3VAR	-73.584024	9.7681505	57.219556	-.3646223
			0	-.06925
INCOME	-.31123805E-01	.33187509E-02	87.950068	-.7091765
			0	-1.72145
UNEMP	18.913205	2.1681873	76.091595	.5732240
			0	.52175
ADVCOST	.21122514	.64281057E-01	10.797549	.1754459
			.001	.12048
REACT	.64920357E-02	.36073061E-02	3.2388870	.1114244
			.073	.06484
BRCADV	-.90353955E-01	.40427360E-01	4.9950939	-.0937328
			.026	-.07121
RCTRS	.46946054	.26816492	3.0642874	.1256497
			.081	.18101
(CONSTANT)	432.44314	36.291412	141.98756	
			0	

VARIABLES NOT IN THE EQUATION

VARIABLE	PARTIAL	TOLERANCE	F / SIGNIFICANCE
MSSNR	.01913	.26744	.10029332
			.752
RCTREX	.01232	.81231	.41577749E-0
			.839
BMA	-.01799	.63197	.68061769E-0
			.766
PROPEN	.02212	.66753	.13417297
			.714
AIDES	.01193	.52810	.39023732E-0
			.844
AREA	-.07660	.73635	1.6173671
			.205
QMA	-.02153	.22391	.12712013
			.722

FINAL MODEL IN REGION USAREC MODEL

* M U L T I P L E   R E G R E S S I O N *

DEPENDENT VARIABLE..   CAIISAM
VARIABLE(S) ENTERED ON STEP NUMBER 12..   AIDES

MULTIPLE R	.83680	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.70024	REGRESSION	12.	562365.37927	46863.78161	40.29553	.00
ADJUSTED R SQUARE	.68286	RESIDUAL	207.	240741.39300	1163.00172		
STD DEVIATION	34.10281	COEFF OF VARIABILITY	21.4 PCT				

------------------- VARIABLES IN THE EQUATION -------------------

VARIABLE	B	STD ERROR B	F / SIGNIFICANCE	BETA / ELASTICITY
RCTRS	2.2401023	.34474214	42.222795	.5121829
			0	.90623
INCOME	-.16544-53E-01	.17819487E-02	86.206641	-.5096929
			0	-1.28697
Q1VAR	-74.244125	7.7821367	91.017829	-.5472676
			0	-.12721
BAA	-.33424900E-01	.15643289E-01	4.5654552	-.1316849
			.034	-.05700
AREA	.19765530E-01	.46026183E-02	18.479658	.1995327
			.000	.11190
Q2VAR	-34.811437	7.3452891	22.460847	-.2566017
			.000	-.05965
ADVCOST	.23950546	.73142396E-01	10.722413	.1777446
			.001	.14736
Q3VAR	-13.718776	7.2694658	3.5614409	-.0951540
			.061	-.01959
RCTREX	.57557512	.28883040	3.9697130	.0649778
			.048	.26900
HSENR	.21693905	.10586938	4.1990010	.1429650
			.042	.33329
REACI	-.39411318E-02	.24810354E-02	2.5233412	-.0971758
			.114	-.05244
AIDES	-.25721218	.17522663	2.1546802	-.0726915
			.144	-.04191
(CONSTANT)	139.58913	39.824791	12.285594	
			.001	

---------- VARIABLES NOT IN THE EQUATION ----------

VARIABLE	PARTIAL	TOLERANCE	F / SIGNIFICANCE
UNEMP	-.05049	.55390	.52636879
			.469
FROPEN	.03547	.24438	.25947778
			.611
DODRCR	-.02046	.35825	.86306506E-0
			.769
URCADV	.02654	.09172	.14521748
			.704
GNA	-.02408	.23246	.11951473
			.730

FINAL MODEL BY REGION USAFEC MODEL

********************** M U L T I P L E   R E G R E S S I O N **********************

DEPENDENT VARIABLE.. CATISAM
VARIABLE(S) ENTERED ON STEP NUMBER 11.. AREA

MULTIPLE R	.87477	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.76522	REGRESSION	11.	1425812.28753	129619.29887	55.11094	
ADJUSTED R SQUARE	.75133	RESIDUAL	186.	437466.46560	2351.97024		
STD DEVIATION	48.49712	COEFF OF VARIABILITY	22.8 PCT				

------------------ VARIABLES IN THE EQUATION ------------------

VARIABLE	B	STD ERROR B	F / SIGNIFICANCE	BETA / ELASTICITY
ACTRS	3.3808938	.40218561	70.665915 .000	1.0534913 1.22849
INCOME	-.27658120E-01	.24955793E-02	122.82957 .000	-.5334624 -1.74456
QVAR	-112.31476	11.018891	103.89466 0	-.5136335 -.14378
UNEMP	14.944775	2.6207826	32.517475 .000	.2157472 .45398
BRCADV	.84625633E-01	.23225559E-01	13.276128 .000	.1457076 .08798
Q3VAR	-57.533817	10.461850	30.243318 .000	-.2485442 -.06138
Q2VAR	-65.937183	10.605190	38.656618 .000	-.3027171 -.08441
ADVCOST	.43252614	.83197698E-01	27.027265 .000	.3169172 .23051
WMA	-.96757880E-01	.23484509E-01	16.969216 .000	-.4008309 -.43393
DODPCR	[illegible]	.13114964	3.7972429 .053	-.1725976 -.16673
AREA	.29192276E-02	.17696805E-02	2.6752754 .103	.0616246 .02233
(CONSTANT)	336.92218	37.742264	79.629901 0	

---------- VARIABLES NOT IN THE EQUATION ----------

VARIABLE	PARTIAL	TOLERANCE	F / SIGNIFICANCE
HSSNR	.07164	.19646	.95442034 .330
REACT	-.00173	.47617	.55157705E-0 .961
RCTREX	.06257	.66573	.73437039 .393
GMA	-.00678	.32060	.83110695E-0 .927
PROFEN	-.04733	.81146	.41533186 .520
AIDES	.01841	.49176	.62725934E-0 .803

FINAL MODEL WEST REGION USAREC MODEL

* M U L T I P L E   R E G R E S S I O N *

DEPENDENT VARIABLE.. CATI3AM
VARIABLE(S) ENTERED ON STEP NUMBER 19.. AIDES

MULTIPLE R	.87383	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.76358	REGRESSION	13.	1689416.62257	145339.74020	67.07964	.00
ADJUSTED R SQUARE	.75220	RESIDUAL	270.	585002.12391	2166.67453		
STD DEVIATION	46.54755	COEFF OF VARIABILITY	22.2 PCT				

------------------- VARIABLES IN THE EQUATION -------------------

VARIABLE	B	STD ERROR B	F / SIGNIFICANCE	BETA / ELASTICITY
INCOME	-.22390814E-01	.23056564E-02	94.308441 .000	-.4379290 -1.41491
ACTRS	3.2026893	.29600928	117.06281 .000	.8198339 1.21968
UNEMP	12.329221	2.5760503	22.906703 .000	.1733794 .41961
Q3VAR	-121.34055	8.5313441	202.29122 0	-.5461211 -.13240
Q1VAR	-125.65040	9.1786806	187.39898 0	-.5984097 -.16242
Q2VAR	-110.77634	8.5943964	166.13561 0	-.5275720 -.14319
DODRCR	-.82204434	.14021708	34.370722 .000	-.4071150 -.55856
ADVCOST	.13128780	.70557314E-01	3.4622995 .064	.0985929 .07306
BMA	-.84334325E-01	.18572637E-01	20.618716 .000	-.2129959 -.19201
QMA	.55215644E-01	.19638343E-01	7.9052866 .005	.1963252 .25068
ACTPEX	1.3254629	.44929672	8.7033796 .003	.1013246 .47206
AREA	-.57760550E-01	.32485316E-01	3.1636528 .076	-.0717645 -.04046
AIDES	.38742306	.26256712	2.1771595 .141	.0561019 .04363
(CONSTANT)	224.27360	56.809133	15.585501 .000	

---------- VARIABLES NOT IN THE EQUATION ----------

VARIABLE	PARTIAL	TOLERANCE	F / SIGNIFICANCE
HSSNR	-.02863	.22901	.22065862 .639
REACT	-.02032	.30738	.11112793 .739
PROPEN	.00841	.13462	.19048210E-0 .890
ORCAUV	.07723	.59348	1.6139124 .205

FINAL MODEL NE REGION JSAREC MODEL

Appendix B-2

Improved USAREC Model

* M U L T I P L E   R E G R E S S I O N *

DEPENDENT VARIABLE.. L13AR

VARIABLE(S) ENTERED ON STEP NUMBER 15.. LPROPEN

MULTIPLE R	.87908	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.77279	REGRESSION	13.	41.76285	3.21253	70.63898	.00
ADJUSTED R SQUARE	.76185	RESIDUAL	270.	12.27909	.04548		
STD DEVIATION	.21326	COEFF OF VARIABILITY	4.1 PCT				

---------- VARIABLES IN THE EQUATION ----------

VARIABLE	B	STD ERROR B	F / SIGNIFICANCE	BETA / ELASTICITY
LINCOME	-1.6030799	.11736937	186.55236	-.5139948
			.000	-2.89491
LRCTRS	1.1517242	.10407546	122.46172	.7918662
			0	.95104
LREACT	-.74521365E-01	.42002845E-01	3.1477786	-.1006663
			.077	-.11119
LUNEAP	.40823406	.80348819E-01	25.814248	.1805976
			.000	.15139
LBRCADV	.61332976E-01	.31833361E-01	3.7121293	.0700079
			.055	.06123
B3VAR	-.52987158	.45348278E-01	136.52735	-.5102990
			.000	-.02310
B1VAR	-.54386416	.50132613E-01	117.69017	-.5542381
			.000	-.02808
B2VAR	-.46843495	.45146953E-01	107.65686	-.4773701
			0	-.02419
LRCTREX	.40506391	.14828823	7.4616301	.0904675
			.007	.33239
LAREA	.11003162	.32685972E-01	11.332148	.2441269
			.001	.09635
LDDBRCR	-.30811928	.85589906E-01	12.959632	-.2445148
			.000	-.28769
LADVCOST	.11133927	.34239866E-01	10.573837	.1561565
			.001	.09722
LPROPEN	-.35836174	.14787327	5.8730527	-.1892763
			.016	-.16237
(CONSTANT)	14.922809	1.4415355	107.16438	
			0	

---------- VARIABLES NOT IN THE EQUATION ----------

VARIABLE	PARTIAL	TOLERANCE	F / SIGNIFICANCE
LHSSHR	.00037	.22361	.36504108E-0
			.995
LBMA	-.04005	.21607	.43209897
			.512
LAIDES	.03580	.57243	.34525626
			.557
LGMA	.07939	.15172	1.7063006
			.193

FINAL MODEL NE REGION MODEL 4

SE-REGION

02 * MULTIPLE REGRESSION *

DEPENDENT VARIABLE.. CAT13AM

VARIABLE(S) ENTERED ON STEP NUMBER 19.. AIDES

MULTIPLE R	.88435	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.78207	REGRESSION	15.	1755710.29747	117047.35316	59.33118	.00
ADJUSTED R SQUARE	.76889	RESIDUAL	248.	489249.39571	1972.77982		
STD DEVIATION	44.41599	COEFF OF VARIABILITY	23.5 PCT				

------------------- VARIABLES IN THE EQUATION -------------------

VARIABLE	B	STD ERROR B	F / SIGNIFICANCE	BETA / ELASTICITY
REACT	-.68906913E-02	.21770257E-02	10.018403 .002	-.1502338 -.10575
RCTRS	4.5397922	.46144378	96.790862 .000	.8195332 1.34719
GMA	.10824980	.38507729E-01	7.9024022 .005	.2568355 .43183
PROPEN	-6.0484711	1.1160614	29.370748 .000	-.2249849 -.54988
INCOME	-.18562413E-01	.26931643E-02	47.505422 .000	-.4615815 -1.08493
DENSITY	-.64094063	.95711393E-01	44.844412 .000	-.6444543 -.56512
Q1VAR	-79.658973	10.155351	61.528953 .000	-.3847205 -.11478
Q3VAR	-50.150480	8.5467440	34.430934 .000	-.2279080 -.06022
Q2VAR	-57.855483	9.2004207	39.543370 .000	-.2794185 -.08336
AREA	-.32002557	.66117867E-01	23.427809 .000	-.4634329 -.51930
ADVCOST	.28643062	.93696728E-01	9.3452312 .002	.1585747 .13690
HSSNR	.40336389	.16315730	6.1119673 .014	.2019253 .46646
DRCADV	-.10219096	.43934714E-01	5.4101504 .021	-.0947041 -.09039
UNEMP	5.0189816	1.8389166	7.4491576 .007	.1658502 .18944
AIDES	.75660075	.28340693	7.1271462 .008	.0938334 .07708
(CONSTANT)	288.62024	51.680280	31.213326 .000	

---------- VARIABLES NOT IN THE EQUATION ----------

VARIABLE	PARTIAL	TOLERANCE	F / SIGNIFICANCE
RCTREX	.00150	.68528	.55230968E-0 .981
BMA	.05419	.21485	.72740354 .395
SODRCR	-.01712	.10475	.72389644E-0 .788

FINAL MODEL SE REGION MODEL 3

* M U L T I P L E   R E G R E S S I O N *

DEPENDENT VARIABLE.. L13AM

VARIABLE(S) ENTERED ON STEP NUMBER 10.. LPROPEN

MULTIPLE R	.85163	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.72528	REGRESSION	10.	28.99952	2.89995	55.17676	.00
ADJUSTED R SQUARE	.71213	RESIDUAL	209.	10.98451	.05256		
STD DEVIATION	.22925	COEFF OF VARIABILITY	4.6 PCT				

-------------------- VARIABLES IN THE EQUATION --------------------

VARIABLE	B	STD ERROR B	F / SIGNIFICANCE	BETA / ELASTICITY
LRCTRS	1.1105429	.14162359	61.315993	.5580700
			0	.92223
LINCOME	-1.4559199	.13550718	115.43841	-.5055505
			0	-2.74750
WIVAR	-.53586799	.50388784E-01	113.09616	-.5598076
			0	-.02930
LDMA	-.17958338	.26303970E-01	46.611136	-.4067552
			0	-.18664
B2VAR	-.24004113	.48346419E-01	24.651463	-.2507648
			.000	-.01312
LADVCOST	.14012615	.41931274E-01	11.167663	.1743972
			.001	.12513
B3VAR	-.12744800	.47682568E-01	7.1440877	-.1252818
			.008	-.00581
LRCTREX	.34265808	.13655454	6.2966519	.0963514
			.013	.29554
LHSSNR	.57148051	.21128449	7.3158979	.2145967
			.007	.62756
LPROPEN	.24967558	.11951308	4.3643674	.1304601
			.038	.13323
(CONSTANT)	9.3707748	1.8213880	26.469520	
			0	

---------- VARIABLES NOT IN THE EQUATION ----------

VARIABLE	PARTIAL	TOLERANCE	F / SIGNIFICANCE
LREACT	-.07838	.37214	1.2858013
			.258
LUNEMP	-.00789	.66728	.12944385E-0
			.910
LDODRCR	.02973	.34139	.18401856
			.668
LAIDES	-.07615	.66674	1.2131263
			.272
LDRCADV	-.05958	.68362	.74102176
			.390
LDMA	-.05942	.25325	.73692784
			.392
LAREA	.09062	.34502	1.7299978
			.190

FINAL MODEL SW REGION MODEL4

* M U L T I P L E   R E G R E S S I O N *

DEPENDENT VARIABLE.. L13AM

VARIABLE(S) ENTERED ON STEP NUMBER 8.. LREACT

MULTIPLE R	.80069	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.64110	REGRESSION	8.	24.24177	3.03022	61.84940	.00
ADJUSTED R SQUARE	.63073	RESIDUAL	277.	13.57121	.04899		
STD DEVIATION	.22134	COEFF OF VARIABILITY	4.1 PCT				

------------------- VARIABLES IN THE EQUATION -------------------

VARIABLE	B	STD ERROR B	F / SIGNIFICANCE	BETA / ELASTICITY
LWDBKCR	.50979450	.60787311E-01	70.360181	.3729776
			0	.46442
Q1VAR	-.66071211	.40586003E-01	184.92780	-.8092594
			0	-.03320
Q2VAR	-.43842833	.45485653E-01	92.906981	-.5369998
			0	-.02203
Q3VAR	-.30474335	.43511717E-01	49.051921	-.3512235
			0	-.01276
LINCOME	-1.7221304	.18495915	86.692285	-.6879902
			0	-3.01203
LUNEMP	.53053049	.60919475E-01	75.841759	.5545380
			0	.17877
LADVCOST	.10153861	.33201447E-01	9.3529463	.1511951
			.002	.08971
LREACT	.11922444	.41726369E-01	8.1641196	.1819169
			.005	.16773
(CONSTANT)	17.257143	1.5931863	117.32880	
			0	

---------- VARIABLES NOT IN THE EQUATION ----------

VARIABLE	PARTIAL	TOLERANCE	F / SIGNIFICANCE
LASSNR	.00770	.32753	.16351726E-0
			.898
LRCTREX	-.03697	.73998	.37774026
			.539
LBMA	.08105	.61613	1.8250458
			.178
LPROPEN	.03998	.74488	.44176252
			.507
LAIDES	-.01449	.52535	.57996232E-0
			.810
LDRCADV	-.06310	.76810	1.1032410
			.294
LOMA	-.02117	.32522	.12378545
			.725
LRCTRS	.06384	.28977	1.1296253
			.289
LAREA	-.00578	.75477	.92349145E-0
			.924

FINAL MODEL AW REGION MODEL 4

* M U L T I P L E   R E G R E S S I O N *

DEPENDENT VARIABLE.. LIJAM

VARIABLE(S) ENTERED ON STEP NUMBER 13.. LRCTREX

MULTIPLE R	.90672	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANC
R SQUARE	.82214	REGRESSION	11.	57.81467	5.25588	78.15806	.00
ADJUSTED R SQUARE	.81162	RESIDUAL	186.	12.50790	.06725		
STD DEVIATION	.25932	COEFF OF VARIABILITY	5.0 PCT				

---------------------- VARIABLES IN THE EQUATION ----------------------

VARIABLE	B	STD ERROR B	F / SIGNIFICANCE	BETA / ELASTICITY
B1VAR	-.62128834	.60638859E-01	104.97463 0	-.4642921 -.03245
LINCOME	-1.7665211	.19524888	82.043351 .000	-.4152715 -3.21653
LRCTRS	.89271132	.16683189	28.632808 .000	.6641834 .72846
LUNEMP	.41810569	.97351799E-01	18.445253 .000	.1484947 .15294
LADVCOST	.30963068	.51564207E-01	36.057140 .000	.3766475 .26746
B2VAR	-.38263242	.58157970E-01	43.285761 .000	-.2859433 -.01999
B3VAR	-.36210332	.57327505E-01	39.896880 .000	-.2546270 -.01576
LAREA	.57695635E-01	.18074753E-01	10.189225 .002	.1351781 .07227
LBMA	.81391242E-01	.40120511E-01	4.1154984 .044	.1499075 .06281
LBMA	-.24162680	.11385148	4.5041499 .035	-.2225757 -.31193
LRCTREX	.25631469	.15889945	2.6019694 .108	.0612400 .21016
(CONSTANT)	16.196915	2.0153640	64.604807 .000	

---------- VARIABLES NOT IN THE EQUATION ----------

VARIABLE	PARTIAL	TOLERANCE	F / SIGNIFICANCE
LHSSNR	-.07796	.05517	1.1313210 .289
LREACT	.00317	.31867	.18551085E-0 .966
LPROPEN	-.06730	.70228	.84182899 .360
LBODRCR	.01771	.07597	.58038517E-0 .810
LAIDES	.01610	.39414	.47993997E-0 .825
LDRCADV	.05269	.65248	.51512661 .474

FINAL MODEL WEST REGION MODEL 4

Appendix B-3

Enhanced USAREC Model SPSS Program

```
RUN NAME       EPM REGRESSION
PRINT BACK     CONTROL
VARIABLES      TIME,QTR,RGN,DRC,AREA,QMA,REACT,HSGNP,RCTRS,NPSMACC,HSDGMACC,
               UNEMP,RCTREX,RCTRSPCT,DODNPS,DODHSDG,INCOME,BMA,
               TOTCON,HSGCON,PROPEN,AIDES,CATI3AM,PSTOTACC,NPSFACC,DRCADV
INPUT MEDIUM   DISK
INPUT FORMAT   FIXED(F4.0,T4,2F1.0,T6,A2,4F5.0,F4.0,F6.0,F6.0,2F3.1,
               F3.3,2F6.0,2F6.0,2F4.0,F3.1,F4.1,4F4.0)
N OF CASES     UNKNOWN
COMPUTE        NEVAR=0
COMPUTE        SEVAR=0
COMPUTE        SWVAR=0
COMPUTE        MWVAR=0
IF             (RGN EQ 1) NEVAR=1
IF             (RGN EQ 3) SEVAR=1
IF             (RGN EQ 4) SWVAR=1
IF             (RGN EQ 5) MWVAR=1
COMPUTE        Q1VAR=0
COMPUTE        Q2VAR=0
COMPUTE        Q3VAR=0
IF             (QTR EQ 1) Q1VAR=1
IF             (QTR EQ 2) Q2VAR=1
IF             (QTR EQ 3) Q3VAR=1
COMPUTE        DODRCR=RCTRS/RCTRSPCT-RCTRS
COMPUTE        DODN=DODNPS-NPSMACC
COMPUTE        DODH=DODHSDG-HSDGMACC
IF             (TIME EQ 7701) ADVCOST=QMA/53865*[illegible]
IF             (TIME EQ 7702) ADVCOST=QMA/53865*5[illegible]4
IF             (TIME EQ 7703) ADVCOST=QMA/53865*4037
IF             (TIME EQ 7704) ADVCOST=QMA/53865*1381
IF             (TIME EQ 7801) ADVCOST=QMA/53265*4234
IF             (TIME EQ 7802) ADVCOST=QMA/53265*3181
IF             (TIME EQ 7803) ADVCOST=QMA/53265*4502
IF             (TIME EQ 7804) ADVCOST=QMA/53265*4037
IF             (TIME EQ 7901) ADVCOST=QMA/53265*5573
IF             (TIME EQ 7902) ADVCOST=QMA/53265*4[illegible]
IF             (TIME EQ 7903) ADVCOST=QMA/53265*[illegible]
IF             (TIME EQ 7904) ADVCOST=QMA/53265*5127
IF             (TIME EQ 8001) ADVCOST=QMA/53265*11[illegible]2
IF             (TIME EQ 8002) ADVCOST=QMA/53265*[illegible]
IF             (TIME EQ 8003) ADVCOST=QMA/53265*4047
IF             (TIME EQ 8004) ADVCOST=QMA/534[illegible]*5047
IF             (TIME EQ 8101) ADVCOST=QMA/534[illegible]*4115
IF             (TIME EQ 8102) ADVCOST=QMA/54840*10771
IF             (TIME EQ 8103) ADVCOST=QMA/54840*[illegible]
IF             (TIME EQ 8104) ADVCOST=QMA/54840*5321
IF             (TIME EQ 8201) ADVCOST=QMA/54840*13[illegible]
IF             (TIME EQ 8202) ADVCOST=QMA/54840*1[illegible]
COMPUTE        POLICY=0
IF             (TIME GE 8101) POLICY=1
COMMENT        THIS POLICY IS FOR THE ASVAB RENORMING
SELECT IF      (DRC NE '7A' AND (TIME GE 7701) )
PRINT FORMATS  RGN(A)
TASK NAME      NE-REGION
COMPUTE        LHSGNR=LN(HSGNR)
COMPUTE        LREACT=LN(REACT)
COMPUTE        LUNEMP=LN(UNEMP)
COMPUTE        LRCTREX=LN(RCTREX)
COMPUTE        LINCOME=LN(INCOME)
COMPUTE        LBMA=LN(BMA)
COMPUTE        LPROPEN=LN(PROPEN)
```

```
COMPUTE         LDOORCR=LN(DOORCR)
COMPUTE         LAIDES=LN(AIDES)
COMPUTE         LADVCOST=LN(ADVCOST)
COMPUTE         LDRCADV=LN(DRCADV)
COMPUTE         LAREA=LN(AREA)
COMPUTE         LOMA=LN(OMA)
COMPUTE         LRCTRS=LN(RCTRS)
COMPUTE         LI3AM=LN(CATI3AM)
COMPUTE         DENSITY=(RCTRS/AREA)*OMA
COMPUTE         LDENS=LN(DENSITY)
*SELECT IF      (RGN EQ 1)
REGRESSION      METHOD=STEPWISE/
                VARIABLES=AREA,REACT,HSGNR,OMA,RCTRS,NPSMACC,HSDGMACC,
                UNEMP,RCTREX,INCOME,BMA,PROPEN,O1VAR,O2VAR,O3VAR,
                DOORCR,AIDES,DOON,DOOM,TOTCON,HSGCON,ADVCOST,
                DRCADV,CATI3AM,PSTOTACC,NPSFACC,
                LI3AM,LHSGNR,LREACT,LUNEMP,LRCTREX,LINCOME,
                LBMA,LPROPEN,LDOORCR,LAIDES,LADVCOST,
                LDRCADV,LOMA,LRCTRS,LDENS,LAREA/
                REGRESSION=LI3AM (9,2.0,3,1.00) WITH LHSGNR,LREACT,
                LUNEMP,LRCTREX,LINCOME,LBMA,LPROPEN,O1VAR,O2VAR,O3VAR,
                LDOORCR,LAIDES,LADVCOST,LDRCADV,LOMA,LRCTRS,LAREA/
                REGRESSION=CATI3AM (8,2.0,3,1.00) WITH HSGNR,REACT,
                UNEMP,RCTREX,INCOME,BMA,PROPEN,O1VAR,O2VAR,O3VAR,
                ,REA,OMA,RCTRS,
                DOORCR,AIDES,ADVCOST,DRCADV,DENSITY/
STATISTICS      ALL
READ INPUT DATA
FINISH
```

Appendix C-1

Codes Used in Multivariate Analyses Tables

Abbreviation	Multivariate Analysis Variables
Acces	DODNP & DODHS (See definitions below)
AFQT	Armed Forces Qualification Test Score
Age	Age of applicant
AirF	Air Force applicant
Army	Army applicant
ArmyR	Army Recruiters as percent of DOD by DRC
Black	Black applicant
BMA	Black Military Available
ColDg	Associates Degree or higher
DODHS	DOD High School Diploma Male Accessions
DODNP	DOD Non-Prior Service Male Accessions
Hispa	Hispanic applicant
HSDip	High School Diploma, less than College Degree
HSS	High School Senior
Incom	Median Disposable Family Income
Marin	Marine applicant
Marri	Married applicant
Month	Month of earliest transaction on applicant
Navy	Navy applicant
NoDip	No High School Diploma
Prior	Prior Service applicant
QMA	Qualified Military Available
Sex	Male, Female applicant
Unemp	DRC Overall Unemployment
White	White applicant
#MHSS	Number of Male High School Seniors

District Recruiting Commands (DRC's)

NERRC

1A Albany
1B Baltimore
1C Boston
1D Concord
1E Harrisburg
1F Ft Monmouth
1G New Haven
1H Newburgh
1I Long Island
1J Niagara Falls
1K Philadelphia
1L Pittsburgh
1N Syracuse

SERRC

3A Atlanta
3B Beckley
3C Charlotte
3D Columbia
3E Jacksonville
3F Louisville
3G Miami
3H Montgomery
3I Nashville
3J Raleigh
3K Richmond
3L San Juan

SWRRC

4A Albuquerque
4C Dallas
4D Denver
4E Houston
4F Jackson
4G Kansas City
4H Little Rock
4I New Orleans
4J Oklahoma City
4K San Antonio

NWRRC

5A Chicago
5B Cincinnati
5C Cleveland
5D Columbus
5E Des Moines
5F Detroit
5H Indianapolis
5I Lansing
5J Milwaukee
5K Minneapolis
5L Omaha
5M Peoria
5N St Louis

WRRC

6A Salt Lake City
6E San Francisco
6F Honolulu
6G Los Angeles
6H Phoenix
6I Portland
6J Sacramento
6K Santa Ana
6L Seattle

General Codes Used in Multivariate Analysis

Component Codes

REG	=	Regular Forces
RSV	=	Reserve Forces

Collective Codes

NAT	=	National level, all Regions, all Components
all	=	all Regions, one Component
PS,F	=	Prior Service and Female records included in analysis

Regional Codes

1	=	NE	=	Northeast Region Recruiting Command (NERRC)
3	=	SE	=	Southeast Region Recruiting Command (SERRC)
4	=	SW	=	Southwest Region Recruiting Command (SWRRC)
5	=	MW	=	Midwest Region Recruiting Command (MWRRC)
6	=	WEST	=	Western Region Recruiting Command (WRRC)

Factor Analysis Table Codes

X = the DRC (or Region) row is associated with the factor column, i.e., the DRC or Region in the given "X" row possesses the particular factor in the column above the "X".

++,+,-, or -- = a given variable in the signed row is associated with the factor in the signed column.

++ = 50 to 99 percent of the variable is like the positive pole of the factor.

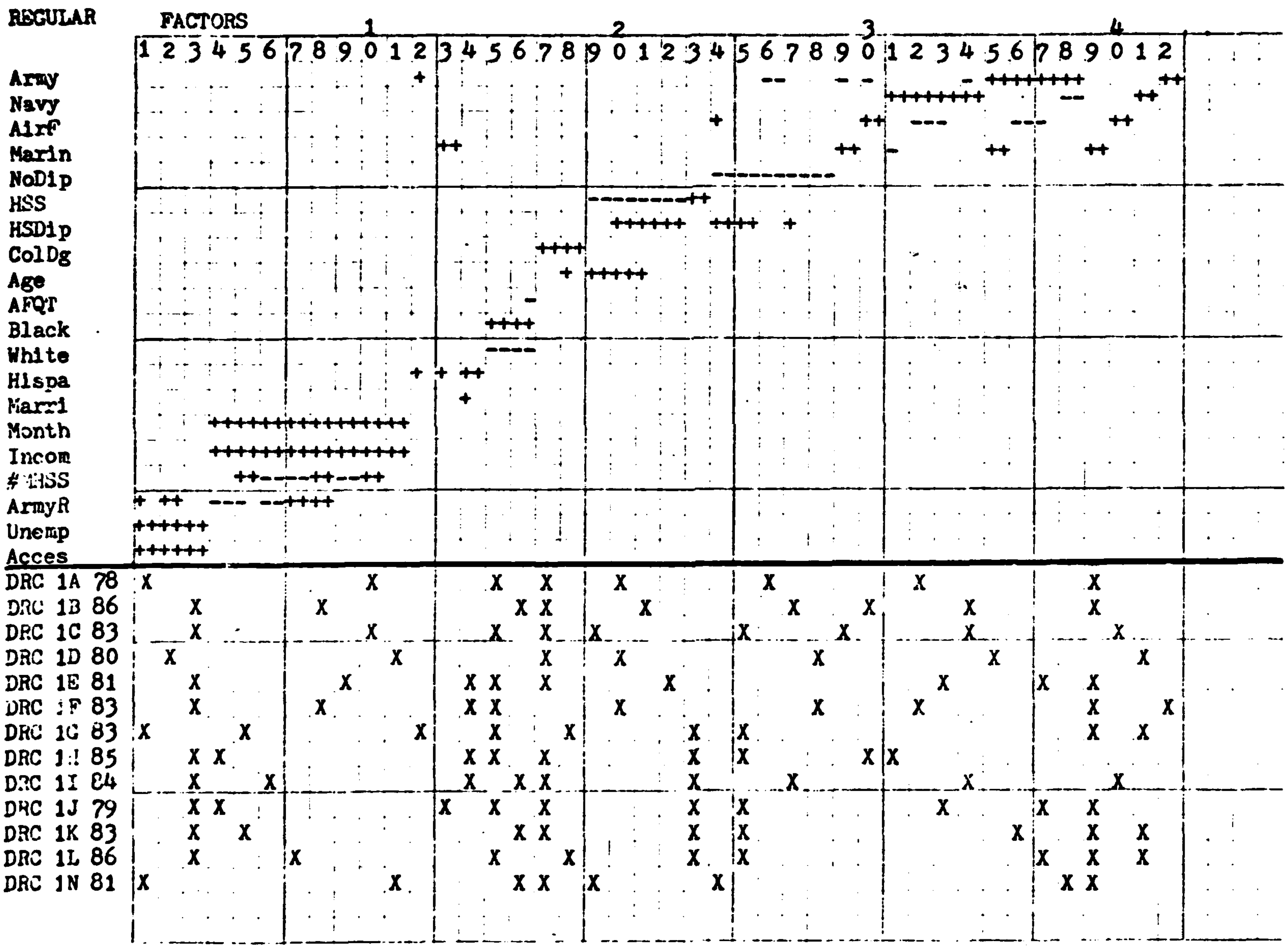
+ = 25 to 50 percent of the variable is like the positive pole of the factor.

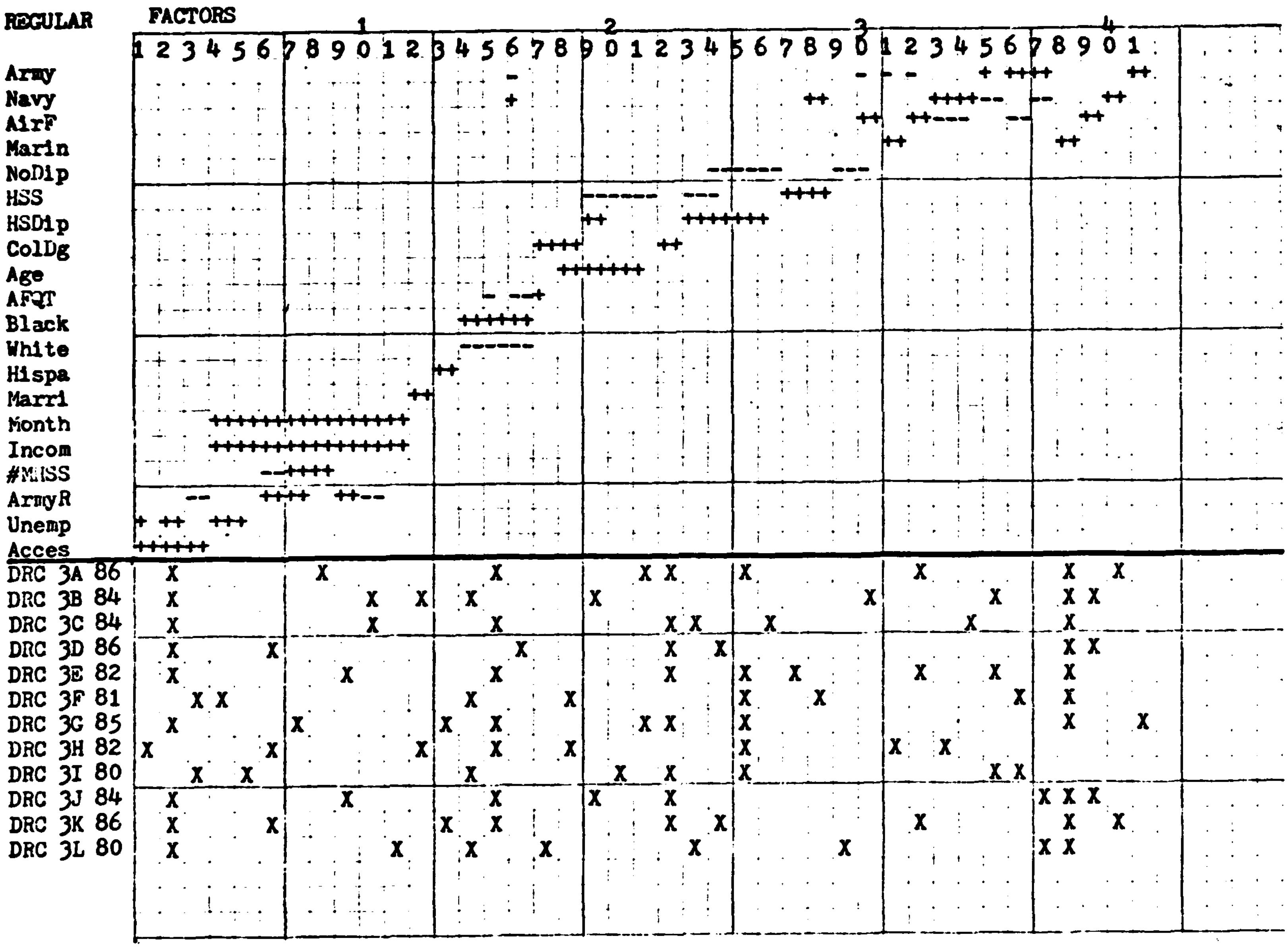
-- = 50 to 90 percent of the variable is like the negative pole of the factor.

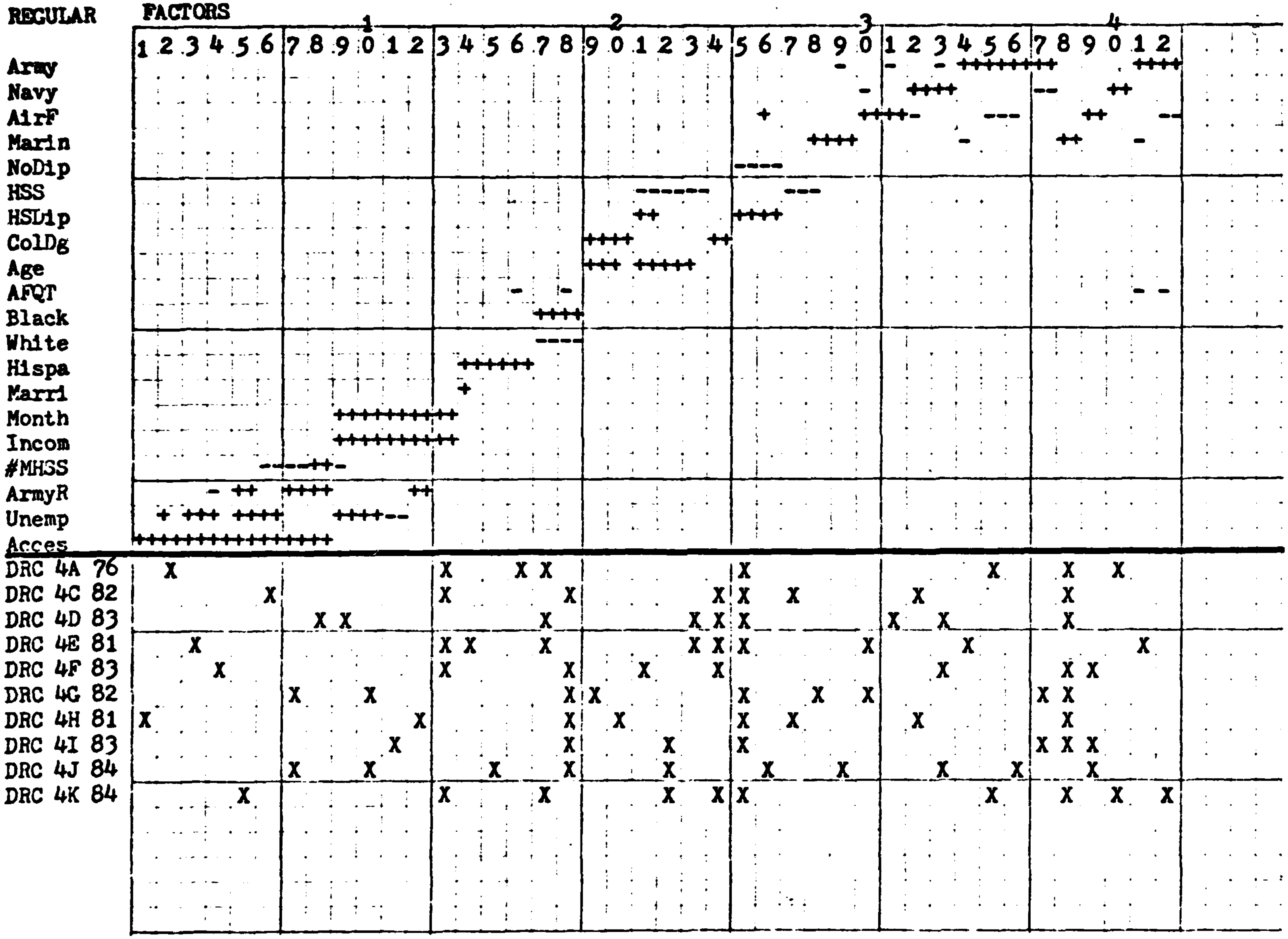
- = 25 to 50 percent of the variable is like the negative pole of the factor.

Appendix C-2

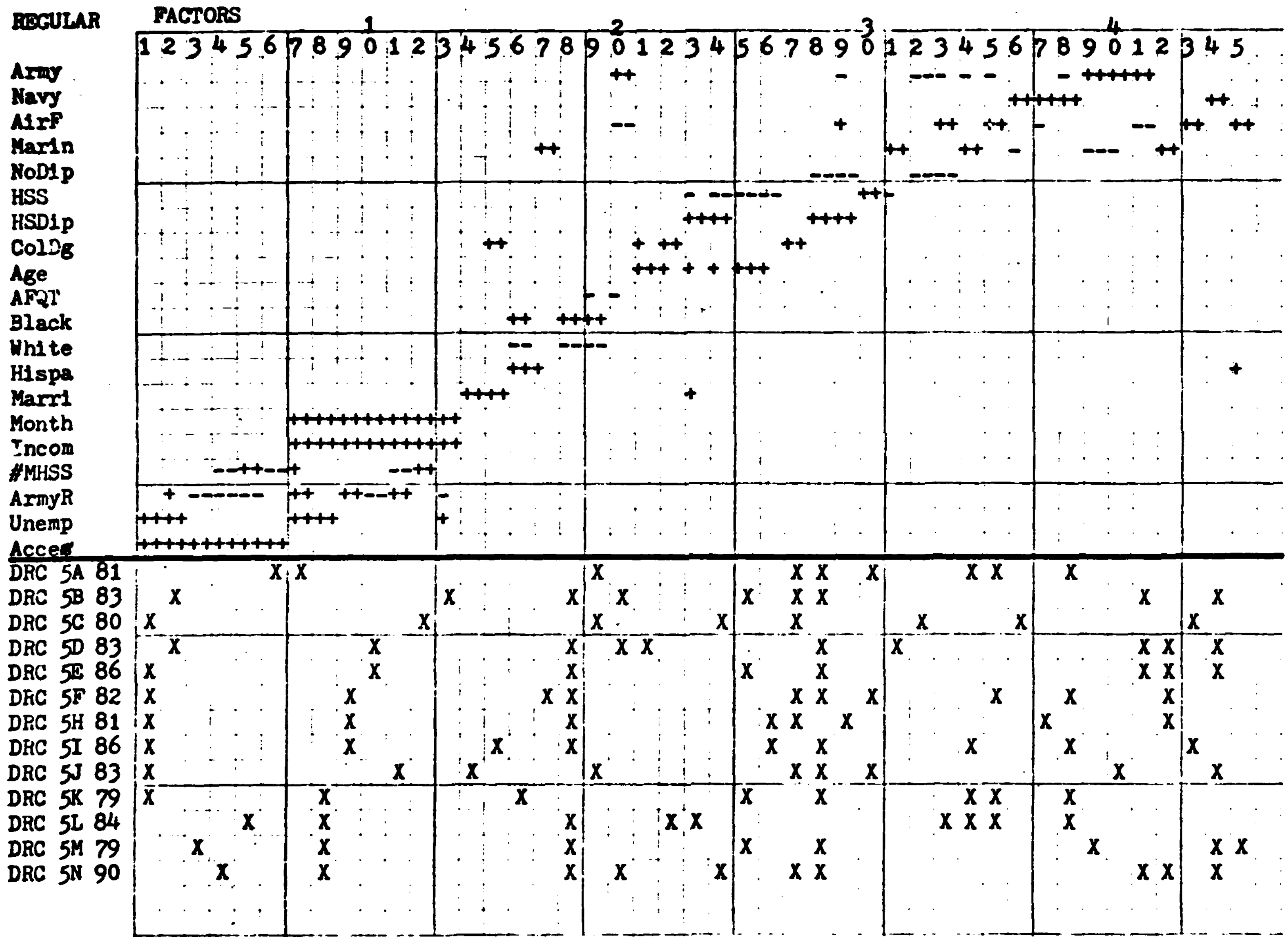
Factor Analysis Tables by DRC


REGULAR
FACTORS
1 2 3 4
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2
Army
Navy
AirF
Marin
NoDip
HSS
HSDip
ColDg
Age
AFQT
Black
White
Hispa
Marri
Month
Incom
#HSS
ArmyR
Unemp
Acces
DRC 1A 78
DRC 1B 86
DRC 1C 83
DRC 1D 80
DRC 1E 81
DRC 1F 83
DRC 1G 83
DRC 1H 85
DRC 1I 84
DRC 1J 79
DRC 1K 83
DRC 1L 86
DRC 1N 81


REGULAR
FACTORS
1 2 3
4
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
Army
Navy
AirF
Marin
NoDip
HSS
HSDip
ColDg
Age
AFQT
Black
White
Hispa
Marri
Month
Incom
#MISS
ArmyR
Unemp
Acces
DRC 3A 86
DRC 3B 84
DRC 3C 84
DRC 3D 86
DRC 3E 82
DRC 3F 81
DRC 3G 85
DRC 3H 82
DRC 3I 80
DRC 3J 84
DRC 3K 86
DRC 3L 80



REGULAR
FACTORS
1
2
3
4
Army
Navy
AirF
Marin
NoDip
HSS
HSDip
ColDg
Age
AFQT
Black
White
Hispa
Marri
Month
Incom
#MHSS
ArmyR
Unemp
Acces
DRC 4A 76
DRC 4C 82
DRC 4D 83
DRC 4E 81
DRC 4F 83
DRC 4G 82
DRC 4H 81
DRC 4I 83
DRC 4J 84
DRC 4K 84


REGULAR
FACTORS
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
Army
Navy
AirF
Marin
NoDip
HSS
HSDip
ColDg
Age
AFQT
Black
White
Hispa
Marri
Month
Incom
#MHSS
ArmyR
Unemp
Acces
DRC 5A 81
DRC 5B 83
DRC 5C 80
DRC 5D 83
DRC 5E 86
DRC 5F 82
DRC 5H 81
DRC 5I 86
DRC 5J 83
DRC 5K 79
DRC 5L 84
DRC 5M 79
DRC 5N 90

```
REGULAR   FACTORS
                            1                   2                   3
          1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9
Army                                                                -   -  ++++      ++++
Navy                                                                      ++++  --    ++
AirF                                                                    ++--  --    ++
Marin                                   ++                                    ++
NoDip                                                         -   ----  -
HSS                                                   --  --- --    ++
HSDip                                                 +   +++++ +++
ColDg                               ++          ++++  ++                              +
Age                                             +++++     +
AFQT                                    -   -   - +
Black                                       ++++
White                                     ------
Hispa                               +++++
Marri                             +++
Month                 ++++++++++++
Incom                 ++++++++++++
#HSS          ++----++      ++++
ArmyR       ++++++--+     ++--++
Unemp       +         +++++++++
Acces     ++++++++++++++
DRC 6A 80           X   X               X   X   X             X   X   X       X     X
DRC 6E 78 X                 X             X           X X           X         X X X X
DRC 6F 82       X     X                 X     X   X           X   X       X   X   X
DRC 6G 82         X   X                       X       X     X X         X X   X
DRC 6H 80   X                   X           X                 X         X     X X   X
DRC 6I 83       X               X           X         X     X X           X   X   X
DRC 6J 76 X               X           X     X       X           X     X               X
DRC 6K 81     X       X           X         X         X       X             X X X
DRC 6L 80 X                   X     X       X             X               X   X   X
```

Appendix C-3

Factor Analysis Table by Region for Regular Forces

REGULAR		FACTORS									1										2										3							
		1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7
Army																																				-	-	++
Navy																																			++		++	
AirF																																			-	++		-
Marin																																		++				
NoDip																																	--					
HSS																											+	++				--						
HSDip																																+	++					
ColDg																													+	++	++							
Prior																						++	++															
Age																						+	++						++	+								
AFQT																										-												
Black																									++	++												
White																									--	--												
Hispa															+	-			+		++			++														
Marri																					+	++	+															
Month														+		++											++	+										
Incom							-			--		--	++	++	--			+		++																		
#MHSS				++	+	++			--		++						--			+																		
ArmyR								++				--			++		++	++	++																			
Unemp			+				++						++	++	++	+																						
BMA		+		+	+	++	++				++	++																										
QMA				-	-			++	++	++																												
Acces		++	++	++	++	++	++	-																														
ALL,PS,F	73	X																	X	X			X			X		X			X		X	X		X	X	
ALL	73	X																	X	X						X		X		X			X	X		X	X	
REG1,PS,F	74				X									X			X					X			X						X	X	X	X		X	X	
REG1	78				X									X			X				X				X					X		X	X	X	X			X
REG3,PS,F	77				X										X								X			X	X				X		X	X		X	X	
REG3	77			X											X											X	X		X				X	X		X	X	
REG4,PS,F	77						X		X														X	X		X	X				X		X	X		X	X	
REG4	77		X						X			X														X		X		X			X	X		X	X	
REG5,PS,F	76							X			X		X									X		X	X						X	X		X		X	X	
REG5	75							X			X		X												X					X		X	X	X		X	X	
REG6,PS,F	76					X				X						X		X					X			X					X		X	X		X	X	
REG6	80					X				X						X		X								X				X		X	X	X		X	X	

Appendix C-4

Factor Analysis Table by Region for Reserve Forces

RESERVE	FACTORS									1										2										3										4					
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5
Army																																			+	--			++				-	-	++
Navy																																				++			--	-			++	++	--
AirF																																										++			
Marin																																			-			++		++	++		-		
Sex																																							+						
NoDip																																		--	--	--									
HSS																				+				-									++				++	++							
HSDip																																		++	++	++									
ColDg																							++					++	+	++	++	++	+												
Prior																						++						+	++	++															
Age																						++	++	++				+	++	++	+														
AFQT																											-	+																	
Black												++														++	++																		
White												--														--	--																		
Hispa										--					++										++																				
Marri																					++	+	+	+																					
Month														++		+			++	++																									
Incom									++				++		--	++		++																											
#MHSS			+	++	+	++				++	++						-																												
ArmyR		-							++						++		++	++																											
Unemp								-	-				++	++	++	+																													
BMA				+	++	++			--		++	+																																	
QMA		--	-	-			++	++	-	-																																			
Acces	++	++	++	++	++	++																																							
RSV1,PS,F 74			X									X	X				X					X			X								X	X					X		X				
RSV1 77					X			X								X	X								X	X					X				X		X							X	
RSV3,PS,F 75				X											X					X							X		X					X							X				X
RSV3 78				X											X				X					X			X					X		X									X		
RSV4,PS,F 75	X								X	X									X								X		X					X				X	X						
RSV4 83	X								X	X									X		X						X				X			X							X				X
RSV5,PS,F 75		X									X		X													X				X				X			X		X		X				
RSV5 75		X									X		X						X					X		X										X				X					
RSV6,PS,F 78						X	X							X				X							X	X		X						X				X	X			X			
RSV6 76						X	X							X				X					X		X		X									X		X							

Appendix C-5

Discriminating Power of Discriminant Functions by DRC (No Accession Variables)

Discriminating Power of Discriminant Functions

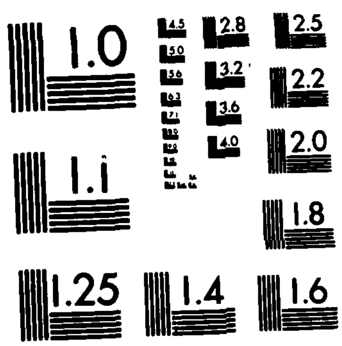
(No Accession Variables)

DRC	Canonical Correlation	Wilks' Lambda	Chi-Squared	Degrees of Freedom	Significance
1A	.536	.713	38.41	5	.0000
1B	.411	.831	50.34	7	.0000
1C	.365	.866	28.52	6	.0001
1D	.459	.789	20.74	7	.0042
1E	.345	.881	26.11	5	.0001
1F	.454	.794	32.84	5	.0000
1G	.466	.783	53.22	5	.0000
1H	.464	.785	27.51	3	.0000
1I	.529	.720	44.98	8	.0000
1J	.307	.906	13.83	3	.0032
1K	.401	.839	37.85	7	.0000
1L	.443	.804	31.38	4	.0000
1N	.468	.781	36.91	8	.0000
3A	.460	.788	54.90	6	.0000
3B	.616	.620	20.52	6	.0022
3C	.525	.724	46.60	7	.0000
3D	.524	.726	56.11	4	.0000
3E	.423	.821	61.19	10	.0000
3F	.351	.877	15.44	7	.0307
3G	.474	.776	38.34	8	.0000
3H	.455	.793	39.22	6	.0000
3I	.324	.895	17.08	6	.0090
3J	.461	.788	29.14	6	.0001
3K	.355	.874	22.22	3	.0001

DRC	Canonical Correlation	Wilks' Lambda	Chi-Squared	Degrees of Freedom	Significance
3L	.538	.711	18.08	4	.0012
4A	.440	.807	18.79	5	.0021
4C	.402	.838	18.52	6	.0051
4D	.296	.912	12.56	4	.0136
4E	.546	.702	35.01	6	.0000
4F	.397	.842	18.17	4	.0011
4G	.410	.832	28.68	5	.0000
4H	.535	.714	37.58	7	.0000
4I	.452	.795	11.82	3	.0080
4J	.263	.931	5.17	2	.0756
4K	.425	.819	18.46	5	.0024
5A	.346	.881	21.12	6	.0017
5B	.288	.917	13.91	3	.0030
5C	.347	.879	37.55	2	.0000
5D	.444	.803	37.38	4	.0000
5E	.351	.876	11.86	4	.0184
5F	.482	.767	47.01	9	.0000
5H	.482	.768	53.82	6	.0000
5I	.309	.905	18.07	4	.0012
5J	.436	.810	26.82	8	.0008
5K	.324	.895	17.16	5	.0042
5L	.410	.832	22.06	6	.0012
5M	.329	.892	19.51	2	.0001
5N	.496	.754	53.91	8	.0000
6A	.493	.757	25.42	7	.0006

AD-A124 845 FACTORS INFLUENCING ARMY ACCESSIONS(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF ENGINEERING K M KALINICH ET AL. DEC 82 AFIT/GOR/OS/82D-7 3/4

UNCLASSIFIED F/G 12/1 NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

DRC	Canonical Correlation	Wilks' Lambda	Chi-Squared	Degrees of Freedom	Significance
6E	.299	.911	4.77	2	.0921
6F	.404	.837	38.66	4	.0000
6G	.412	.830	21.81	6	.0013
6H	.330	.891	10.80	5	.0555
6I	.447	.800	34.94	6	.0000
6J	.481	.769	17.35	6	.0081
6K	.338	.886	16.91	5	.0047
6L	.480	.770	26.79	7	.0004

Appendix C-6

Discriminating Power of Discriminant Functions by DRC (With DOD Accession Variables)

Discriminating Power of Discriminant Functions
(With DOD Accession Variables)

DRC	Canonical Correlation	Wilks' Lambda	Chi-Squared	Degrees of Freedom	Significance
1F	.457	.791	32.34	5	.0000
1I	.551	.697	49.11	10	.0000
1N	.485	.765	39.75	9	.0000
3A	.492	.758	63.81	8	.0000
3E	.422	.822	60.94	9	.0000
3I	.334	.889	18.11	7	.0115
3L	.553	.694	19.17	5	.0018
4C	.399	.841	18.19	6	.0058
4D	.328	.892	15.54	5	.0083
4E	.542	.706	34.66	5	.0000
4F	.447	.800	23.37	6	.0007
4K	.444	.803	20.23	6	.0025
5F	.479	.771	46.29	8	.0000
5H	.487	.763	55.03	7	.0000
5J	.431	.814	26.25	7	.0005
5K	.392	.847	25.31	10	.0048
5L	.386	.851	19.48	4	.0006
5M	.395	.844	28.60	4	.0000
5N	.500	.750	54.87	8	.0000
6A	.503	.747	26.73	7	.0004
6L	.505	.745	29.90	9	.0005

Appendix C-7

Discriminating Power of Discriminant Functions by Region

(No Accession Variables)

Discriminating Power of Discriminant Functions by Region

(No Accession Variables)

	Canonical Correlation	Wilks' Lambda	Chi-Squared	Degrees of Freedom	Significance
All PS,F	.352	.876	1903.5	15	0
All	.333	.889	1260.2	14	0
REG all PS,F	.378	.857	1766.0	16	0
REG all	.333	.889	1020.6	13	0
RSV1 PS,F	.493	.757	145.47	11	.0000
RSV1	.468	.781	99.57	9	.0000
RSV3 PS,F	.645	.584	147.32	11	.0000
RSV3	.600	.639	89.43	8	.0000
RSV4 PS,F	.520	.730	63.86	10	.0000
RSV4	.459	.789	35.74	8	.0000
RSV5 PS,F	.577	.667	175.24	10	0
RSV5	.569	.676	132.53	7	.0000
RSV6 PS,F	.617	.619	115.47	15	.0000
RSV6	.530	.719	65.10	11	.0000
REG1 PS,F	.380	.855	443.98	13	0
REG1	.332	.890	253.97	10	0
REG3 PS,F	.430	.815	525.72	13	0
REG3	.393	.845	318.80	8	0
REG4 PS,F	.380	.856	231.95	12	0
REG4	.373	.861	168.31	8	0
REG5 PS,F	.346	.880	373.20	9	0
REG5	.297	.912	207.03	11	0
REG6 PS,F	.337	.886	179.99	12	0
REG6	.267	.929	83.14	6	.0000

Appendix C-8

Discriminating Power of Discriminant Functions by Region (With DOD Accession Variables)

Discriminating Power of Discriminant Functions by Region

(With DOD Accession Variables)

	Canonical Correlation	Wilks' Lambda	Chi-Squared	Degrees of Freedom	Significance
REG all PS,F	.380	.855	1787.8	17	0
REG all	.336	.887	1038.9	12	0
RSV1 PS,F	.501	.749	150.70	13	.0000
RSV3 PS,F	.645	.584	147.32	11	.0000
RSV5 PS,F	.579	.665	176.32	11	0
REG1	.337	.886	263.00	9	0
REG3 PS,F	.431	.814	528.79	11	0
REG3	.396	.843	323.21	10	0
REG5	.302	.909	213.53	11	0
REG6	.274	.925	87.66	9	.0000

Appendix C-9

Standardized Canonical Discriminant Function Coefficients by DRC (No Accessions Variables)

STANDARDIZED CANONICAL DISCRIMINANT FUNCTION COEFFICIENTS
(NO ACCESSIONS VARIABLES)

DRC	Month	AFQT	NoDip	HSS	HSDip	ColDg	Age	White	Black
1A	1.11	-.46	.87				-.28		
1B		-.73				.23	.46	-.95	-.70
1C		-.68				.45	.53	.27	
1D	-1.25	-.31	.83			.58	-.36		
1E		-.45			-.47	.56	.44		
1F		-.55					.55		
1G		-.71			-.48		.49	-.31	
1H		-.87				.56			
1I	.47	-.50			-.38		.51	-.84	-.58
1J				.45			.99		.31
1K		-.49	.55				.50	-.20	-1.03
1L		-.91					.28		.31
1N	-1.67	-.68	.26			.28	.47		-.39
3A		-.98			-.34	.18	.38		
3B		-.83	.58			.42	.38		.31
3C	1.18		.55			-.17	.31	-.77	
3D		-.95		.38			.36		
3E	-1.10	-.38		.28	-.34		.40	-.88	-.48
3F		-.57	.38				.51		-.37
3G	-1.27	-.65	.24				.56		
3H		-.64			-.54	-.62	.53	-.23	
3I		-.86			-.38	.44	.49		-.29
3J		-.57				-.45	.28	-1.24	-.83
3K		-.75				-.28			.32

STANDARDIZED CANONICAL DISCRIMINANT FUNCTION COEFFICIENTS
(NO ACCESSIONS VARIABLES)

DRC	Hispa	Marri	#HHSS	Unemp	ArmyR	Incom	Centroids Non-Army	Centroids Army
1A						-.75	-.417	.950
1B		-.18				.27	-.390	.518
1C				-.35		.30	-.279	.546
1D		-.34				1.03	-.353	.741
1E					-.49		-.251	.535
1F	.21			.27		.31	-304	.841
1G	-.20						-.359	.764
1H				.24			-.291	.926
1I	-.39	-.32					-.440	.871
1J							-.224	.458
1K	-.38		.43				-.257	.740
1L		.28					-.329	.730
1N					.23	-1.87	-.396	.700
3A		.15			.16		-.538	.494
3B					.60		-.734	.798
3C		.34				-.73	-.500	.751
3D				.38			-.575	.650
3E				.51	.33	.62	-.406	.534
3F		.47		.51		-.40	-.363	.381
3G	-.30	.26		.66		1.03	-.403	.708
3H			.20				-.422	.612
3I		-.42					-.258	.449
3J					.28		-495	.536
3K							-.331	.431

DRC	Month	AFQT	NoDip	HSS	HSDip	ColDg	Age	White	Black
3L		-.34			-.87		.76		
4A					-.82		.78		.50
4C	-.99				-.54				.46
4D		-.44					.58		
4E		-.89	.47					-.20	
4F		-.79	.59				.34		
4G		-.74	.36			-.29	.43		.37
4H		-.48	.64			.46	-.22	.90	1.34
4I		-.70		.49					
4J			.65					-.86	
4K		-.76			-.68		.95		-.36
5A		-.52	.58	.36			.61		
5B		-.72	-.40						
5C			.10				.24		
5D		-.94			-.41	.45			
5E			.68				-.47		
5F	.43	-.68		.59	.23	.42	.36	-1.06	-1.29
5H		-.35	.71			.32		-.43	
5I		-.77	.81		.41		.30		
5J		-.28	.25				.81		
5K	.41	-.54	.71						
5L	-.91	-.34				.52		-.63	-.37
5M		-.91			-.44				
5N	-1.18	-.67			-.28	.26	.59	-.29	
6A		-1.09		.45	.32		.69	.44	-.41
6E		-.72							

DRC	Hispa	Marri	#MHSS	Unemp	ArmyR	Incom	Centroids Non-Army	Army
3L				.29			-1.358	.289
4A	.48	-.46					-.425	.552
4C			-.57		-.85	1.78	-.349	.543
4D					-.52		-.253	.374
4E		.36		.42	-.31		-.531	.784
4F						.56	-.384	.478
4G							-.365	.548
4H				-.32			-.571	.690
4I					.45		-.362	.686
4J							-.259	.280
4K		-.29					-.357	.605
5A	.27		-.34				-.316	.424
5B				.55			-.271	.330
5C							-.299	.455
5D		.32					-.482	.505
5E		.50			-.52		-.279	.493
5F				-.48			-.434	.691
5H		.39		-.33			-.439	.680
5I							-.253	.412
5J	-.25	-.31	-1.44		-2.31	1.07	-.410	.564
5K	.42	.36					-.294	.394
5L				1.29			-.382	.519
5M							-.221	.544
5N			.30	1.27			-.526	.613
6A			.27				-.479	.654

DRC	Month	AFQT	NoDip	HSS	HSDip	ColDg	Age	White	Black
6F		-.82			-.57		.39	.44	
6G		-.94	-.26				.26		
6H		-.47	.65				.61	.59	
6I			.33	.85			.91	-.51	-.32
6J					-.43	.35	.49	-.70	-.59
6K		-.69					.33	.66	.57
6L		-.64		.66				-.62	-.36

DRC	Hispa	Marri	#MHSS	Unemp	ArmyR	Incom	Centroids	
							Non-Army	Army
6E				.69			-.307	.307
6F							-.331	.584
6G			.62	.84		-1.13	-.400	.504
6H				.37			-.230	.521
6I	-.25						-.341	.722
6J	.54						-.315	.929
6K			-.61				-.264	.481
6L		.29	.50		-.69		-.344	.853

Appendix C-10

Standardized Canonical Discriminant Function Coefficients by DRC (With DOD Accession Variables)

Standardized Canonical Discriminant Function Coefficients
(With DOD Accession Variables)

DRC	Month	AFQT	NoDip	HSS	HSDip	ColDg	Age	White	Black	Hispa
1F		-.55					-.55			.21
1I		-.56			-.32	.17	.46	-.79	-.57	-.40
1N	-1.24	-.67	.22			.26	.46		-.39	
3A	-.73	-.92			-.28	.17	.39			
3E	-.77	-.39		.27	-.35		.40	-.87	-.47	
3I		-.85			-.35	.40	.48		-.29	
3L		-.41			-.81		.74			-.28
4C	-1.01				-.54				.46	
4D		-.37	.58				.49			
4E		-.93	.45							
4F		-.74	.55				.38			
4K		-.73			-.64		.87		-.32	
5F		-.69		.59	.22	.42	.37	-1.06	-1.30	
5H		-.33	.71			.32		-.44		
5J		-.31	.26				.81			-.26
5K		-.31	.76	.39		-.32	.45	.44		.49
5L		-.30				.54		-.27		
5M		-.66			-.48					
5N	-1.16	-.66			-.27	.25	.59	-.30		
6A		-1.10		.45	.31		.67	.45	-.39	
6L		-.56		.56				-.59	-.30	

Standardized Canonical Discriminant Function Coefficients

(With DOD Accession Variables)

DRC	Marri	#MHSS	Unemp	ArmyR	DODNP	DODHS	Incom	Centroids Non-Army	Centroids Army
1F						.29	.32	-.31	.85
1I	-.32			-.36		.50		-.47	.92
1N			.29		-.57		1.66	-.41	.73
3A	.17	.86			.69			-.59	.54
3E			1.38		-.83			-.41	.53
3I	-.43					-.56		-.27	.46
3L					-.38			-1.41	.30
4C				-.77		.38	1.29	-.35	.54
4D				-1.04	.74			-.28	.42
4E	.38		.65		-.48			-.53	.78
4F				-1.58	-1.25		1.42	-.44	.55
4K	-.29					.32		-.38	.64
5F					-.47			-.43	.68
5H	.37		-.61			.33		-.45	.69
5J	-.32		-1.93		2.19			-.41	.56
5K	.26		.65			-.80		-.37	.49
5L						.71		-.36	.48
5M				.58	.95			-.27	.67
5N			1.62			-.45		-.53	.62
6A					.36			-.49	.67
6L	.36	1.77		-.47	1.10		-1.03	-.37	.91

Appendix C-11

Standardized Canonical Discriminant Function Coefficients by Region (No Accession Variables)

Standardized Canonical Discriminant Function Coefficients

(Region, No Accession Variables)

	Prior	Sex	Month	AFQT	NoDip	HSS	HSDip	ColDg	Age	White	Black
All PS,F	.26	.29	.16	-.47	.52	.22			.41	-.16	.18
All			.15	-.71	.50	.21		.03	.42	-.08	.13
REG PS,F all	.35	.25	.19	-.66		-.08	-.35	.06	.35	-.11	.12
REG all			.17	-.76		-.07	-.43	.05	.46	-.10	.89
RSV1 PS,F	.27	.34	.19	-.23	.39		-.48		.48		
RSV1			.17			-.32	-1.01		.21		
RSV3 PS,F	.47	.63		-.27	.46				.37		.31
RSV3				-.28	.50	.15			.27		.16
RSV4 PS,F	.29	.61		-.41	.46				.44		
RSV4			.38	-.62	.43	-.23			.37		
RSV5 PS,F	.41	.38	.27	-.53			-.69		.29		
RSV5				-.29			-.81		.28		.28
RSV6 PS,F	.61	.43	.27	-.32	.35		-.44		.17	.21	
RSV6			.19	-.40	.86				.26		-.17
REG1 PS,F	.38	.32	.26	-.58	.09		-.22	.14	.32	-.28	
REG1			.20	-.68			-.45	.10	.45	-.31	
REG3 PS,F	.34	.19	.20	-.67			-.30	-.08	.33	-.29	
REG3				-.77		.09	-.29		.40	-.20	
REG4 PS,F	.30	.23	.21	-.69	.35				.42	-.25	
REG4				-.79	.17		-.28		.45	-.33	
REG5 PS,F	.44	.24	.27	-.67	-.36		-.94		.29		
REG5			.18	-.72	-.29	-.63	-1.05		.40		
REG6 PS,F	.54	.19		-.57		.11	-.16		.48		.09
REG6				-.73		.29	-.25		.64		

Standardized Canonical Discriminant Function Coefficients

(Region, No Accession Variables)

	Hispa	Marri	QMA	#MHSS	Unemp	ArmyR	Incom	BMA	Centroids Non-Army	Army
All PS,F		.07		-.03	.12	.05	-.18	-.08	-.36	.39
All		.07		-.06	.12	.05	-.18	-.06	-.30	.41
REG PS,F all	-.06		-.05	-.11	.07	.06	-.13		-.36	.46
REG all		.03		-.07	.11	.05	-.16		-.28	.44
RSV1 PS,F	.15		-.10		.30		-.24		-.83	.39
RSV1	.16		-.14	-.13	.31		-.36		-.66	.42
RSV3 PS,F			-.12	.23	.35		.14	-.71	-1.01	.70
RSV3			-.18	.22				-1.06	-.71	.78
RSV4 PS,F	-.17		.44	.35		.37		-.21	-.69	.53
RSV4	.19			.26		.38			-.54	.48
RSV5 PS,F			-.22			-.11	-.37	.28	-1.13	.44
RSV5			-.28				-.53	.32	-.93	.51
RSVPS,F	.16	.22	.15	-.50	-.25	.35		.59	-.80	.76
RSV6	-.18		.29	-.71	-.28		.26	.73	-.51	.76
REG1 PS,F	-.07	.10				.07	-.13		-.72	.53
REG1	-.08	.11			-.09		-.08		-.24	.51
REG3 PS,F	-.06			.12	-.13		-.13	-.16	-.48	.47
REG3	-.07	.14			.28				-.39	.47
REG4 PS,F	-.09		.14	.18	.09	.18			-.38	.45
REG4			.13		.14			-.32	-.35	.47
REG5 PS,F			.07						-.33	.41
REG5	.08	.12	.09			-.15	-.11		-.26	.37
REG6 PS,F	-.08	-.19		-.36			.21	.29	-.30	.43
REG6				-.16			.27		-.22	.35

Appendix C-12

Standardized Canonical Discriminant Function Coefficients by Region (With DOD Accession Variables)

Standardized Canonical Discriminant Function Coefficients

(Region, With DOD Accession Variables)

	Prior	Sex	Month	AFQT	NoDip	HSS	HSDip	ColDg
REG all PS,F	.34	.24	.16	-.66	-.22	-.27	-.60	
REG all			.12	-.76	-.18	-.25	-.64	
RSV1 PS,F	.28	.33	.21	-.18	.38		-.46	
RSV3 PS,F	.47	.63		-.27	.46			
RSV5 PS,F	.40	.38	.26	-.53			-.69	
REG1				-.67			-.45	.09
REG3 PS,F	.33	.19	.17	-.67			-.30	-.08
REG3				-.78		.09	-.29	
REG5				-.72		-.37	-.69	.08
REG6				-.73		.27	-.24	

	Age	White	Black	Hispa	Marri	QMA	#MHSS	Unemp
REG all PS,F	.35	-.10	.13	-.05		-.03	-.15	
REG all	.46	-.08	.09				-.14	
RSV1 PS,F	.45	-.14		.12		-.16		.32
RSV3 PS,F	.37		.31			-.12	.23	.35
RSV5 PS,F	.30					-.25		
REG1	.46	-.29			.11			-.21
REG3 PS,F	.33	-.28						
REG3	.40	-.21		-.06				.24
REG5	.40			.09	.13			
REG6	.64	.15					-.28	-.16

Standardized Canonical Discriminant Function Coefficients

(Region, With DOD Accession Variables)

	ArmyR	Incom	BMA	DODNP	DODHS	Centroids Non-Army	Centroids Army
REG all PS,F	.10	-.10	-.15		.16	-.37	.46
REG all	.13	-.09			.19	-.29	.44
RSV1 PS,F		-.27		-.20		-.84	.39
RSV3 PS,F		.14	-.71	.18		-1.01	.70
RSV5 PS,F	-.13	-.35	.32	-.12		-1.14	.44
REG1				-.45	.69	-.25	.52
REG3 PS,F	.36		-.11	.21		-.48	.48
REG3			-.12	.15		-.39	.47
REG5	-.11	-.09		-.52	.56	-.27	.38
REG6		.26			.25	-.22	.36

Appendix C-13

Percentages of Cases Correctly Classified into Army and Non-Army by DRC (No Accession Variables)

Percentages of Cases Correctly Classified into Army and Non-Army

(No Accession Variables)

	Analysis Cases			Random Sample		
DRC	Non-Army	Army	Total	Non-Army	Army	Total
1A	75.6	55.6	69.5	72.8	36.1	62.5
1B	65.2	70.6	67.5	69.5	58.7	65.0
1C	67.4	62.3	65.7	63.9	54.1	61.1
1D	76.2	56.7	69.9	74.6	43.9	63.4
1E	72.0	49.3	64.8	66.4	50.0	61.4
1F	72.2	64.1	70.1	70.0	54.1	66.2
1G	74.8	74.6	74.8	73.3	56.9	68.6
1H	74.2	71.4	73.5	71.9	64.5	70.1
1I	81.1	72.9	78.3	65.1	59.2	63.2
1J	69.8	51.1	63.6	65.2	51.2	61.3
1K	72.6	56.1	68.3	76.9	63.6	73.0
1L	67.6	65.2	66.9	75.4	58.3	71.5
1N	74.7	67.9	72.3	63.9	62.5	63.4
3A	68.1	78.9	73.7	66.9	70.4	68.5
3B	80.0	73.9	77.1	59.4	73.3	66.1
3C	83.3	63.3	75.3	62.2	64.5	63.1
3D	69.5	72.6	71.0	60.4	72.7	66.3
3E	68.3	66.4	67.5	65.5	59.0	62.6
3F	73.0	63.3	68.3	66.2	61.7	64.1
3G	77.0	64.9	72.6	61.7	57.4	60.3
3H	69.9	67.6	69.0	79.4	72.0	76.0
3I	65.3	62.1	64.2	60.2	61.0	60.6
3J	68.2	67.2	67.7	63.8	64.2	64.0

DRC	Analysis Cases			Random Sample		
	Non-Army	Army	Total	Non-Army	Army	Total
3K	62.1	67.1	64.3	69.1	65.8	67.6
3L	100.0	78.7	82.5	84.2	69.4	72.8
4A	65.4	72.5	68.5	46.2	68.1	55.4
4C	64.2	69.8	66.4	69.3	42.0	58.4
4D	69.0	59.6	65.3	67.0	69.2	68.0
4E	80.6	78.6	79.8	67.5	61.8	65.3
4F	62.3	73.5	67.3	73.0	61.3	67.2
4G	65.6	65.6	65.6	61.2	62.5	61.8
4H	73.4	81.1	76.9	66.7	65.5	66.1
4I	69.4	68.4	69.1	63.0	56.0	60.6
4J	69.2	52.8	61.3	65.7	51.5	61.0
4K	75.4	72.2	74.2	76.1	57.4	68.6
5A	72.4	56.2	65.5	62.4	64.3	63.3
5B	61.1	59.5	60.4	63.0	62.3	62.7
5C	87.6	41.0	69.2	88.2	43.9	71.6
5D	66.3	74.1	70.1	63.0	72.2	67.0
5E	71.7	55.9	66.0	70.0	45.5	60.5
5F	74.3	71.8	73.4	74.6	45.9	63.3
5H	78.7	64.6	73.2	79.5	52.1	67.1
5I	63.2	55.6	60.3	68.6	60.6	65.6
5J	74.0	67.9	71.4	65.5	48.3	58.5
5K	65.9	61.8	64.2	64.8	51.4	58.8
5L	62.5	64.2	63.2	51.3	63.6	56.3
5M	63.4	60.0	62.4	60.0	61.9	60.7
5N	71.7	67.0	69.5	68.9	59.3	64.9
6A	75.0	70.7	73.2	64.9	43.6	57.8

DRC	Analysis Cases Non-Army	Army	Total	Random Sample Non-Army	Army	Total
6E	63.0	51.9	57.4	59.4	63.2	61.4
6F	68.8	70.0	69.2	53.1	65.1	57.5
6G	76.5	64.8	71.3	67.1	34.0	53.5
6H	57.4	60.0	58.2	52.6	52.4	52.5
6I	72.7	63.5	69.8	64.9	54.9	60.7
6J	94.3	50.0	83.1	91.5	34.8	77.7
6K	74.2	62.7	70.1	69.0	56.4	64.5
6L	70.2	67.7	75.9	58.7	49.0	54.8

Appendix C-14

Percentages of Cases Correctly Classified into Army and Non-Army by DRC (With DOD Accession Variables)

Percentages of Cases Correctly Classified into Army and Non-Army
(With DOD Accession Variables)

	Analysis Cases			Random Sample		
DRC	Non-Army	Army	Total	Non-Army	Army	Total
1F	74.1	71.8	73.5	67.5	54.1	64.3
1I	78.9	75.0	77.6	61.3	55.1	59.4
1N	74.7	71.4	73.6	63.9	62.5	63.4
3A	69.9	78.9	74.6	64.6	67.6	66.0
3E	70.0	67.9	69.1	66.1	57.6	62.3
3I	68.3	58.6	64.8	54.2	59.8	57.0
3L	100.0	76.6	80.7	78.9	74.2	75.3
4C	64.2	69.8	66.4	68.0	42.0	57.6
4D	70.2	56.1	64.5	67.0	64.6	66.0
4E	79.0	81.0	79.8	70.0	63.4	67.8
4F	62.3	71.4	66.4	74.6	53.2	64.0
4K	68.9	69.4	69.1	74.6	51.1	65.3
5F	75.2	74.6	75.0	74.6	47.3	63.8
5H	78.7	64.6	73.2	76.9	53.1	66.2
5J	74.0	66.1	70.7	66.7	48.3	59.2
5K	74.7	63.2	69.8	71.4	47.3	60.6
5L	59.7	67.9	63.2	46.2	67.3	54.8
5M	66.7	64.0	65.9	60.9	55.6	59.0
5N	72.6	70.3	71.6	68.9	59.3	64.9
6A	73.2	73.2	73.2	62.3	46.2	56.9
6L	75.3	64.5	72.2	56.0	55.1	55.7

Appendix C-15

Percentages of Cases Correctly Classified into Army and Non-Army by Region (No Accession Variables)

Percentages of Cases Correctly Classified into Army and Non-Army by Region

(No Accession Variables)

	Analysis Cases			Random Sample		
	Non-Army	Army	Total	Non-Army	Army	Total
All PS,F	63.6	68.6	66.2	63.8	68.7	66.4
All	62.4	67.4	65.0	62.2	67.0	64.7
REG all PS,F	68.6	65.1	67.0	68.9	65.3	67.4
REG all	64.3	65.0	64.6	64.3	62.1	63.4
RSV1 PS,F	72.2	73.4	73.0	71.0	73.8	63.4
RSV1	68.8	72.7	71.2	70.6	70.2	70.4
RSV3 PS,F	90.4	74.1	80.8	82.1	71.1	70.4
RSV3	83.3	71.4	77.7	75.9	64.9	71.0
RSV4 PS,F	80.2	68.1	73.3	77.1	71.3	73.2
RSV4	67.6	69.9	68.8	62.8	65.5	64.2
RSV5 PS,F	82.9	79.8	80.7	77.6	78.5	78.3
RSV5	75.4	78.8	77.6	77.2	71.4	73.5
RSV6 PS,F	79.5	77.3	78.4	74.0	81.6	77.8
RSV6	76.4	69.5	73.7	69.5	74.7	71.8
REG1 PS,F	69.8	63.4	67.4	73.4	62.3	69.4
REG1	65.8	61.7	64.5	64.9	61.6	63.9
REG3 PS,F	71.0	70.1	70.6	71.4	69.6	70.5
REG3	68.0	66.9	67.5	66.9	69.9	68.3
REG4 PS,F	68.6	65.3	67.1	68.3	69.7	69.0
REG4	63.7	68.5	65.8	64.1	61.9	63.3
REG5 PS,F	66.5	64.6	65.6	67.1	62.2	64.9
REG5	64.1	62.0	63.3	63.5	58.9	61.6
REG6 PS,F	69.6	59.6	65.5	68.6	56.9	63.7
REG6	65.4	58.4	62.7	66.0	60.6	64.1

Appendix C-16

Percentages of Cases Correctly Classified
into Army and Non-Army by Region
(With DOD Accession Variables)

Percentages of Cases Correctly Classified into Army and Non-Army by Region (With DOD Accession Variables)

	Analysis Cases			Random Sample		
	Non-Army	Army	Total	Non-Army	Army	Total
REG all PS,F	68.2	65.0	66.7	68.8	65.7	67.4
REG all	64.3	65.1	64.6	64.0	61.9	63.2
RSV1 PS,F	72.8	73.7	73.4	72.3	72.3	72.3
RSV3 PS,F	90.4	74.1	80.8	82.1	71.1	75.9
RSV5 PS,F	82.9	79.5	80.5	76.1	77.3	77.0
REG1	66.7	61.1	64.9	63.1	62.4	62.9
REG3 PS,F	70.0	69.6	69.8	72.5	69.5	70.9
REG3	67.7	66.6	67.2	67.1	68.8	67.9
REG5	63.4	62.1	62.9	63.1	58.5	61.3
REG6	64.8	60.3	63.1	65.3	61.9	64.1

Appendix C-17

FORTRAN Program for Condensing Critical Variables from MEPS File

```
      PROGRAM SHRINK(TAPE1=/690,TAPE2=/72,OUTPUT)
      K=0
10    READ(1,1) STATUS,SERV,PSERV,STACO1,SEX,
     -    RACE,ETHNIC,STACO2,MARSTA,YRMOB,
     -    YRSED,EDCERT,MENTCAT,AFQT,ENSTAT,
     -    DATE1,DATE2,DATE3,DATE4,DATE5,
     -    DATE6,DATE7,DATE8,DATE9,DATE10
1     FORMAT(T14,A1,T16,A2,T56,A1,T58,A5,T70,A1,
     -    T71,A1,T72,A1,T73,A5,T83,A1,T88,A4,
     -    T96,A2,T98,A1,T120,A2,T128,A2,T202,A1,
     -    T272,A4,T296,A4,T320,A4,T344,A4,T368,A4,
     -    T392,A4,T416,A4,T440,A4,T464,A4,T488,A4)
      IF(EOF(1)) 100,200
200   K=K+1
      WRITE(2,2) STATUS,SERV,PSERV,STACO1,SEX,
     -    RACE,ETHNIC,STACO2,MARSTA,YRMOB,
     -    YRSED,EDCERT,MENTCAT,AFQT,ENSTAT,
     -    DATE1,DATE2,DATE3,DATE4,DATE5,
     -    DATE6,DATE7,DATE8,DATE9,DATE10
2     FORMAT(A1,A2,A1,A5,A1,
     -       A1,A1,A5,A1,A4,
     -       A2,A1,A2,A2,A1,
     -       10A4)
      GO TO 10
      PRINT *,K
      STOP
      END
```

Appendix C-18

FORTRAN Program for Recoding MEPS State and County Codes to USAREC DRC Codes

```
      PROGRAM RECODE
      INTEGER ICOUNH,ICOUNN,IBIRTH,IYRSED,IDATE(10),ODATE
      CHARACTER ISTATC,ISERU,ISERUC,IPRIOR,ISTAH*2,
     -    ISEX,IRACE,IETHNI,ISTAN*2,IMARI,
     -    IEDCER,IMCAT*2,IAFQT*2,IESTAT,ODRC*2
      INTEGER OSTATC,OSERU,OSERUC,OMCAT,
     -    OEDCER,OENTRY,OACT,OAGE,OSEX,ORACE,
     -    OHISP,OMARI,OPRIOR
      OPEN(1,FILE='SHRINK')
      OPEN(2,FILE='RECODE')
      K=0
      L=0
10    READ(1,1,END=999) ISTATC,ISERU,ISERUC,IPRIOR,ISTAH,ICOUNH,
     -    ISEX,IRACE,IETHNI,ISTAN,ICOUNN,IMARI,
     -    IBIRTH,IYRSED,IEDCER,IMCAT,IAFQT,IESTAT,
     -    IDATE(1),IDATE(2),IDATE(3),IDATE(4),IDATE(5),
     -    IDATE(6),IDATE(7),IDATE(8),IDATE(9),IDATE(10)
1     FORMAT(A1,A1,A1,A1,A2,I3,
     -    A1,A1,A1,A2,I3,A1,
     -    I4,I2,A1,A2,A2,A1,
     -    10I4)
      L=L+1
      IF(ISTATC.EQ.'A')GOTO20
      IF(ISTATC.EQ.'B')GOTO20
      IF(ISTATC.EQ.'C')GOTO20
      IF(ISTATC.EQ.'D')GOTO20
      GOTO10
20    K=K+1
      OSTATC=0
      IF(ISTATC.EQ.'D')THEN
          OSTATC=1
          GOTO205
      ENDIF
      IF(ISTATC.EQ.'A')THEN
          OSTATC=2
          IF(IESTAT.EQ.'0')OSTATC=3
      ENDIF
      IF(OSTATC.EQ.0)THEN
          IF(IESTAT.EQ.'2')THEN
              OSTATC=4
          ELSEIF(IESTAT.EQ.'1')THEN
              OSTATC=5
              ELSEIF(IESTAT.EQ.'0')THEN
                      OSTATC=6
          ENDIF
      ENDIF
205   OSERU=2
      IF(ISERU.EQ.'M')OSERU=1
      IF(ISERU.EQ.'N')OSERU=3
      IF(ISERU.EQ.'F')OSERU=4
      OSERUC=0
      IF(ISERUC.EQ.'G')OSERUC=1
      IF(ISERUC.EQ.'U')OSERUC=2
      IF(ISERUC.EQ.'R')OSERUC=3
      IF(ISTAN.EQ.'  ')ISTAN=ISTAH
      IF(ISTAN.EQ.' 0')ISTAN=ISTAH
      IF(ISTAN.EQ.'0 ')ISTAN=ISTAH
      IF(ISTAN.EQ.'00')ISTAN=ISTAH
      IF(ICOUNN.EQ.0)ICOUNN=ICOUNH
      ODRC='  '
      IF(ISTAN.EQ.'36')THEN
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          IF(ICOUNN.EQ.  1)ODRC='1A'
          IF(ICOUNN.EQ. 19)ODRC='1A'
          IF(ICOUNN.EQ. 21)ODRC='1A'
          IF(ICOUNN.EQ. 25)ODRC='1A'
          IF(ICOUNN.EQ. 27)ODRC='1A'
          IF(ICOUNN.EQ. 31)ODRC='1A'
          IF(ICOUNN.EQ. 33)ODRC='1A'
          IF(ICOUNN.EQ. 35)ODRC='1A'
          IF(ICOUNN.EQ. 39)ODRC='1A'
          IF(ICOUNN.EQ. 41)ODRC='1A'
          IF(ICOUNN.EQ. 57)ODRC='1A'
          IF(ICOUNN.EQ. 77)ODRC='1A'
          IF(ICOUNN.EQ. 83)ODRC='1A'
          IF(ICOUNN.EQ. 91)ODRC='1A'
          IF(ICOUNN.EQ. 93)ODRC='1A'
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          IF(ICOUNN.EQ.113)ODRC='1A'
          IF(ICOUNN.EQ.115)ODRC='1A'
          IF(ICOUNN.EQ.  3)ODRC='1J'
          IF(ICOUNN.EQ.  9)ODRC='1J'
          IF(ICOUNN.EQ. 13)ODRC='1J'
          IF(ICOUNN.EQ. 29)ODRC='1J'
          IF(ICOUNN.EQ. 37)ODRC='1J'
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          IF(ICOUNN.EQ. 55)ODRC='1J'
          IF(ICOUNN.EQ. 63)ODRC='1J'
          IF(ICOUNN.EQ. 73)ODRC='1J'
          IF(ICOUNN.EQ.121)ODRC='1J'
          IF(ICOUNN.EQ.  5)ODRC='1H'
          IF(ICOUNN.EQ. 71)ODRC='1H'
          IF(ICOUNN.EQ. 79)ODRC='1H'
          IF(ICOUNN.EQ. 87)ODRC='1H'
          IF(ICOUNN.EQ.105)ODRC='1H'
          IF(ICOUNN.EQ.119)ODRC='1H'
          IF(ICOUNN.EQ. 47)ODRC='1G'
          IF(ICOUNN.EQ. 59)ODRC='1G'
          IF(ICOUNN.EQ. 81)ODRC='1G'
          IF(ICOUNN.EQ. 85)ODRC='1G'
          IF(ICOUNN.EQ.103)ODRC='1G'
          GOTO230
      ENDIF
      IF(ISTAN.EQ.' 6')GOTO211
      IF(ISTAN.EQ.'06')THEN
211       ODRC='6I'
          IF(ICOUNN.EQ.  1)ODRC='6A'
          IF(ICOUNN.EQ.  4)ODRC='6A'
          IF(ICOUNN.EQ. 13)ODRC='6A'
          IF(ICOUNN.EQ. 53)ODRC='6A'
          IF(ICOUNN.EQ. 69)ODRC='6A'
          IF(ICOUNN.EQ. 81)ODRC='6A'
          IF(ICOUNN.EQ. 85)ODRC='6A'
          IF(ICOUNN.EQ. 87)ODRC='6A'
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      IF(ICOUNN.EQ. 27)ODRC='6F'
      IF(ICOUNN.EQ. 37)ODRC='6F'
      IF(ICOUNN.EQ. 51)ODRC='6F'
      IF(ICOUNN.EQ. 79)ODRC='6F'
      IF(ICOUNN.EQ. 83)ODRC='6F'
      IF(ICOUNN.EQ.111)ODRC='6F'
      IF(ICOUNN.EQ. 25)ODRC='6K'
      IF(ICOUNN.EQ. 59)ODRC='6K'
      IF(ICOUNN.EQ. 65)ODRC='6K'
      IF(ICOUNN.EQ. 71)ODRC='6K'
      IF(ICOUNN.EQ. 73)ODRC='6K'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'39')THEN
      ODRC='5D'
      IF(ICOUNN.EQ.  5)ODRC='5C'
      IF(ICOUNN.EQ.  7)ODRC='5C'
      IF(ICOUNN.EQ. 19)ODRC='5C'
      IF(ICOUNN.EQ. 29)ODRC='5C'
      IF(ICOUNN.EQ. 35)ODRC='5C'
      IF(ICOUNN.EQ. 39)ODRC='5C'
      IF(ICOUNN.EQ. 43)ODRC='5C'
      IF(ICOUNN.EQ. 51)ODRC='5C'
      IF(ICOUNN.EQ. 55)ODRC='5C'
      IF(ICOUNN.EQ. 69)ODRC='5C'
      IF(ICOUNN.EQ. 75)ODRC='5C'
      IF(ICOUNN.EQ. 77)ODRC='5C'
      IF(ICOUNN.EQ. 85)ODRC='5C'
      IF(ICOUNN.EQ. 93)ODRC='5C'
      IF(ICOUNN.EQ. 95)ODRC='5C'
      IF(ICOUNN.EQ. 99)ODRC='5C'
      IF(ICOUNN.EQ.103)ODRC='5C'
      IF(ICOUNN.EQ.123)ODRC='5C'
      IF(ICOUNN.EQ.125)ODRC='5C'
      IF(ICOUNN.EQ.133)ODRC='5C'
      IF(ICOUNN.EQ.143)ODRC='5C'
      IF(ICOUNN.EQ.147)ODRC='5C'
      IF(ICOUNN.EQ.151)ODRC='5C'
      IF(ICOUNN.EQ.153)ODRC='5C'
      IF(ICOUNN.EQ.155)ODRC='5C'
      IF(ICOUNN.EQ.157)ODRC='5C'
      IF(ICOUNN.EQ.169)ODRC='5C'
      IF(ICOUNN.EQ.171)ODRC='5C'
      IF(ICOUNN.EQ.173)ODRC='5C'
      IF(ICOUNN.EQ.  1)ODRC='5B'
      IF(ICOUNN.EQ. 15)ODRC='5B'
      IF(ICOUNN.EQ. 17)ODRC='5B'
      IF(ICOUNN.EQ. 25)ODRC='5B'
      IF(ICOUNN.EQ. 27)ODRC='5B'
      IF(ICOUNN.EQ. 37)ODRC='5B'
      IF(ICOUNN.EQ. 57)ODRC='5B'
      IF(ICOUNN.EQ. 61)ODRC='5B'
      IF(ICOUNN.EQ. 71)ODRC='5B'
      IF(ICOUNN.EQ.109)ODRC='5B'
      IF(ICOUNN.EQ.113)ODRC='5B'
      IF(ICOUNN.EQ.135)ODRC='5B'
      IF(ICOUNN.EQ.149)ODRC='5B'
      IF(ICOUNN.EQ.165)ODRC='5B'
      IF(ICOUNN.EQ. 13)ODRC='1L'
      IF(ICOUNN.EQ. 67)ODRC='1L'
      IF(ICOUNN.EQ. 81)ODRC='1L'
      IF(ICOUNN.EQ.111)ODRC='1L'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'42')THEN
      ODRC='1E'
      IF(ICOUNN.EQ.  3)ODRC='1L'
      IF(ICOUNN.EQ.  5)ODRC='1L'
      IF(ICOUNN.EQ.  7)ODRC='1L'
      IF(ICOUNN.EQ. 19)ODRC='1L'
      IF(ICOUNN.EQ. 21)ODRC='1L'
      IF(ICOUNN.EQ. 23)ODRC='1L'
      IF(ICOUNN.EQ. 31)ODRC='1L'
      IF(ICOUNN.EQ. 33)ODRC='1L'
      IF(ICOUNN.EQ. 39)ODRC='1L'
      IF(ICOUNN.EQ. 47)ODRC='1L'
      IF(ICOUNN.EQ. 51)ODRC='1L'
      IF(ICOUNN.EQ. 53)ODRC='1L'
      IF(ICOUNN.EQ. 59)ODRC='1L'
      IF(ICOUNN.EQ. 63)ODRC='1L'
      IF(ICOUNN.EQ. 65)ODRC='1L'
      IF(ICOUNN.EQ. 73)ODRC='1L'
      IF(ICOUNN.EQ. 85)ODRC='1L'
      IF(ICOUNN.EQ.111)ODRC='1L'
      IF(ICOUNN.EQ.121)ODRC='1L'
      IF(ICOUNN.EQ.125)ODRC='1L'
      IF(ICOUNN.EQ.129)ODRC='1L'
      IF(ICOUNN.EQ. 17)ODRC='1K'
      IF(ICOUNN.EQ. 29)ODRC='1K'
      IF(ICOUNN.EQ. 45)ODRC='1K'
      IF(ICOUNN.EQ. 91)ODRC='1K'
      IF(ICOUNN.EQ.101)ODRC='1K'
      IF(ICOUNN.EQ. 49)ODRC='1J'
      IF(ICOUNN.EQ. 83)ODRC='1J'
      IF(ICOUNN.EQ.123)ODRC='1J'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'12')THEN
      ODRC='3E'
      IF(ICOUNN.EQ. 11)ODRC='3G'
      IF(ICOUNN.EQ. 15)ODRC='3G'
      IF(ICOUNN.EQ. 21)ODRC='3G'
      IF(ICOUNN.EQ. 25)ODRC='3G'
      IF(ICOUNN.EQ. 27)ODRC='3G'
      IF(ICOUNN.EQ. 43)ODRC='3G'
      IF(ICOUNN.EQ. 49)ODRC='3G'
      IF(ICOUNN.EQ. 51)ODRC='3G'
      IF(ICOUNN.EQ. 55)ODRC='3G'
      IF(ICOUNN.EQ. 61)ODRC='3G'
      IF(ICOUNN.EQ. 71)ODRC='3G'
      IF(ICOUNN.EQ. 81)ODRC='3G'
      IF(ICOUNN.EQ. 85)ODRC='3G'
      IF(ICOUNN.EQ. 87)ODRC='3G'
      IF(ICOUNN.EQ. 93)ODRC='3G'
      IF(ICOUNN.EQ. 99)ODRC='3G'
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      IF(ICOUNN.EQ.111)ODRC='3G'
      IF(ICOUNN.EQ.115)ODRC='3G'
      IF(ICOUNN.EQ.  5)ODRC='3H'
      IF(ICOUNN.EQ. 13)ODRC='3H'
      IF(ICOUNN.EQ. 33)ODRC='3H'
      IF(ICOUNN.EQ. 45)ODRC='3H'
      IF(ICOUNN.EQ. 59)ODRC='3H'
      IF(ICOUNN.EQ. 63)ODRC='3H'
      IF(ICOUNN.EQ. 91)ODRC='3H'
      IF(ICOUNN.EQ.113)ODRC='3H'
      IF(ICOUNN.EQ.131)ODRC='3H'
      IF(ICOUNN.EQ.133)ODRC='3H'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.'17')THEN
      ODRC='5N'
      IF(ICOUNN.EQ.  7)ODRC='5M'
      IF(ICOUNN.EQ. 11)ODRC='5M'
      IF(ICOUNN.EQ. 15)ODRC='5M'
      IF(ICOUNN.EQ. 19)ODRC='5M'
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      IF(ICOUNN.EQ. 53)ODRC='5M'
      IF(ICOUNN.EQ. 57)ODRC='5M'
      IF(ICOUNN.EQ. 63)ODRC='5M'
      IF(ICOUNN.EQ. 75)ODRC='5M'
      IF(ICOUNN.EQ. 85)ODRC='5M'
      IF(ICOUNN.EQ. 89)ODRC='5M'
      IF(ICOUNN.EQ. 91)ODRC='5M'
      IF(ICOUNN.EQ. 93)ODRC='5M'
      IF(ICOUNN.EQ. 95)ODRC='5M'
      IF(ICOUNN.EQ. 99)ODRC='5M'
      IF(ICOUNN.EQ.103)ODRC='5M'
      IF(ICOUNN.EQ.105)ODRC='5M'
      IF(ICOUNN.EQ.111)ODRC='5M'
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      IF(ICOUNN.EQ.155)ODRC='5M'
      IF(ICOUNN.EQ.175)ODRC='5M'
      IF(ICOUNN.EQ.177)ODRC='5M'
      IF(ICOUNN.EQ.179)ODRC='5M'
      IF(ICOUNN.EQ.187)ODRC='5M'
      IF(ICOUNN.EQ.195)ODRC='5M'
      IF(ICOUNN.EQ.197)ODRC='5M'
      IF(ICOUNN.EQ.201)ODRC='5M'
      IF(ICOUNN.EQ.203)ODRC='5M'
      IF(ICOUNN.EQ. 71)ODRC='5E'
      IF(ICOUNN.EQ. 73)ODRC='5E'
      IF(ICOUNN.EQ.131)ODRC='5E'
      IF(ICOUNN.EQ.161)ODRC='5E'
      IF(ICOUNN.EQ. 23)ODRC='5H'
      IF(ICOUNN.EQ. 33)ODRC='5H'
      IF(ICOUNN.EQ. 45)ODRC='5H'
      IF(ICOUNN.EQ.183)ODRC='5H'
      IF(ICOUNN.EQ. 31)ODRC='5A'
      IF(ICOUNN.EQ. 43)ODRC='5A'
      IF(ICOUNN.EQ. 97)ODRC='5A'
      IF(ICOUNN.EQ.127)ODRC='4F'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.'48')THEN
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      IF(ICOUNN.EQ.  7)ODRC='4K'
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      IF(ICOUNN.EQ. 19)ODRC='4K'
      IF(ICOUNN.EQ. 21)ODRC='4K'
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      IF(ICOUNN.EQ.105)ODRC='4K'
      IF(ICOUNN.EQ.123)ODRC='4K'
      IF(ICOUNN.EQ.127)ODRC='4K'
      IF(ICOUNN.EQ.131)ODRC='4K'
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      IF(ICOUNN.EQ.171)ODRC='4K'
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      IF(ICOUNN.EQ.261)ODRC='4K'
      IF(ICOUNN.EQ.265)ODRC='4K'
      IF(ICOUNN.EQ.267)ODRC='4K'
      IF(ICOUNN.EQ.271)ODRC='4K'
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      IF(ICOUNN.EQ.307)ODRC='4K'
      IF(ICOUNN.EQ.311)ODRC='4K'
      IF(ICOUNN.EQ.319)ODRC='4K'
      IF(ICOUNN.EQ.323)ODRC='4K'
      IF(ICOUNN.EQ.325)ODRC='4K'
      IF(ICOUNN.EQ.327)ODRC='4K'
      IF(ICOUNN.EQ.355)ODRC='4K'
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IF(ICOUNN.EQ.495)ODRC='4A'
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IF(ICOUNN.EQ. 51)ODRC='4E'
IF(ICOUNN.EQ. 71)ODRC='4E'
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IF(ICOUNN.EQ.345)ODRC='4J'
IF(ICOUNN.EQ.357)ODRC='4J'
IF(ICOUNN.EQ.359)ODRC='4J'
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      IF(ICOUNN.EQ.369)ODRC='4J'
      IF(ICOUNN.EQ.375)ODRC='4J'
      IF(ICOUNN.EQ.381)ODRC='4J'
      IF(ICOUNN.EQ.393)ODRC='4J'
      IF(ICOUNN.EQ.421)ODRC='4J'
      IF(ICOUNN.EQ.437)ODRC='4J'
      IF(ICOUNN.EQ.483)ODRC='4J'
      IF(ICOUNN.EQ. 37)ODRC='4H'
      IF(ICOUNN.EQ. 67)ODRC='4H'
      IF(ICOUNN.EQ.183)ODRC='4H'
      IF(ICOUNN.EQ.203)ODRC='4H'
      IF(ICOUNN.EQ.315)ODRC='4H'
      IF(ICOUNN.EQ.365)ODRC='4H'
      IF(ICOUNN.EQ.401)ODRC='4H'
      IF(ICOUNN.EQ.419)ODRC='4H'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.'26')THEN
      ODRC='5I'
      IF(ICOUNN.EQ.  3)ODRC='5J'
      IF(ICOUNN.EQ. 13)ODRC='5J'
      IF(ICOUNN.EQ. 41)ODRC='5J'
      IF(ICOUNN.EQ. 43)ODRC='5J'
      IF(ICOUNN.EQ. 53)ODRC='5J'
      IF(ICOUNN.EQ. 61)ODRC='5J'
      IF(ICOUNN.EQ. 71)ODRC='5J'
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      IF(ICOUNN.EQ.103)ODRC='5J'
      IF(ICOUNN.EQ.109)ODRC='5J'
      IF(ICOUNN.EQ.131)ODRC='5J'
      IF(ICOUNN.EQ.153)ODRC='5J'
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      IF(ICOUNN.EQ.115)ODRC='5F'
      IF(ICOUNN.EQ.125)ODRC='5F'
      IF(ICOUNN.EQ.161)ODRC='5F'
      IF(ICOUNN.EQ.163)ODRC='5F'
      IF(ICOUNN.EQ. 21)ODRC='5M'
      IF(ICOUNN.EQ. 27)ODRC='5M'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.'37')THEN
      ODRC='3C'
      IF(ICOUNN.EQ.  1)ODRC='3J'
      IF(ICOUNN.EQ. 13)ODRC='3J'
      IF(ICOUNN.EQ. 15)ODRC='3J'
      IF(ICOUNN.EQ. 17)ODRC='3J'
      IF(ICOUNN.EQ. 19)ODRC='3J'
      IF(ICOUNN.EQ. 31)ODRC='3J'
      IF(ICOUNN.EQ. 33)ODRC='3J'
      IF(ICOUNN.EQ. 37)ODRC='3J'
      IF(ICOUNN.EQ. 47)ODRC='3J'
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      IF(ICOUNN.EQ. 51)ODRC='3J'
      IF(ICOUNN.EQ. 55)ODRC='3J'
      IF(ICCUNN.EQ. 61)ODRC='3J'
      IF(ICOUNN.EQ. 63)ODRC='3J'
      IF(ICOUNN.EQ. 65)ODRC='3J'
      IF(ICOUNN.EQ. 69)ODRC='3J'
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      IF(ICOUNN.EQ. 77)ODRC='3J'
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      IF(ICOUNN.EQ. 95)ODRC='3J'
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      IF(ICOUNN.EQ.107)ODRC='3J'
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      IF(ICOUNN.EQ.129)ODRC='3J'
      IF(ICOUNN.EQ.131)ODRC='3J'
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      IF(ICOUNN.EQ.135)ODRC='3J'
      IF(ICOUNN.EQ.137)ODRC='3J'
      IF(ICOUNN.EQ.141)ODRC='3J'
      IF(ICOUNN.EQ.143)ODRC='3J'
      IF(ICOUNN.EQ.147)ODRC='3J'
      IF(ICOUNN.EQ.155)ODRC='3J'
      IF(ICOUNN.EQ.163)ODRC='3J'
      IF(ICOUNN.EQ.165)ODRC='3J'
      IF(ICOUNN.EQ.177)ODRC='3J'
      IF(ICOUNN.EQ.181)ODRC='3J'
      IF(ICOUNN.EQ.183)ODRC='3J'
      IF(ICOUNN.EQ.185)ODRC='3J'
      IF(ICOUNN.EQ.187)ODRC='3J'
      IF(ICOUNN.EQ.191)ODRC='3J'
      IF(ICOUNN.EQ.195)ODRC='3J'
      IF(ICOUNN.EQ. 29)ODRC='3K'
      IF(ICOUNN.EQ. 41)ODRC='3K'
      IF(ICOUNN.EQ. 53)ODRC='3K'
      IF(ICOUNN.EQ.139)ODRC='3K'
      IF(ICOUNN.EQ.143)ODRC='3K'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.'13')THEN
      ODRC='3A'
      IF(ICOUNN.EQ.  1)ODRC='3E'
      IF(ICOUNN.EQ.  3)ODRC='3E'
      IF(ICOUNN.EQ.  5)ODRC='3E'
      IF(ICOUNN.EQ. 19)ODRC='3E'
      IF(ICOUNN.EQ. 25)ODRC='3E'
      IF(ICOUNN.EQ. 27)ODRC='3E'
      IF(ICOUNN.EQ. 39)ODRC='3E'
      IF(ICOUNN.EQ. 49)ODRC='3E'
      IF(ICOUNN.EQ. 65)ODRC='3E'
      IF(ICOUNN.EQ. 69)ODRC='3E'
      IF(ICOUNN.EQ. 75)ODRC='3E'
      IF(ICOUNN.EQ.101)ODRC='3E'
      IF(ICOUNN.EQ.109)ODRC='3E'
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      IF(ICOUNN.EQ.127)ODRC='3E'
      IF(ICOUNN.EQ.131)ODRC='3E'
      IF(ICOUNN.EQ.161)ODRC='3E'
      IF(ICOUNN.EQ.173)ODRC='3E'
      IF(ICOUNN.EQ.179)ODRC='3E'
      IF(ICOUNN.EQ.183)ODRC='3E'
      IF(ICOUNN.EQ.185)ODRC='3E'
      IF(ICOUNN.EQ.191)ODRC='3E'
      IF(ICOUNN.EQ.209)ODRC='3E'
      IF(ICOUNN.EQ.229)ODRC='3E'
      IF(ICOUNN.EQ.267)ODRC='3E'
      IF(ICOUNN.EQ.275)ODRC='3E'
      IF(ICOUNN.EQ.279)ODRC='3E'
      IF(ICOUNN.EQ.299)ODRC='3E'
      IF(ICOUNN.EQ.305)ODRC='3E'
      IF(ICOUNN.EQ. 29)ODRC='3D'
      IF(ICOUNN.EQ. 31)ODRC='3D'
      IF(ICOUNN.EQ. 33)ODRC='3D'
      IF(ICOUNN.EQ. 43)ODRC='3D'
      IF(ICOUNN.EQ. 51)ODRC='3D'
      IF(ICOUNN.EQ. 73)ODRC='3D'
      IF(ICOUNN.EQ.103)ODRC='3D'
      IF(ICOUNN.EQ.107)ODRC='3D'
      IF(ICOUNN.EQ.163)ODRC='3D'
      IF(ICOUNN.EQ.165)ODRC='3D'
      IF(ICOUNN.EQ.181)ODRC='3D'
      IF(ICOUNN.EQ.189)ODRC='3D'
      IF(ICOUNN.EQ.245)ODRC='3D'
      IF(ICOUNN.EQ.251)ODRC='3D'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.'34')THEN
      ODRC='1I'
      IF(ICOUNN.EQ.  1)ODRC='1K'
      IF(ICOUNN.EQ.  5)ODRC='1K'
      IF(ICOUNN.EQ.  7)ODRC='1K'
      IF(ICOUNN.EQ.  9)ODRC='1K'
      IF(ICOUNN.EQ. 11)ODRC='1K'
      IF(ICOUNN.EQ. 15)ODRC='1K'
      IF(ICOUNN.EQ. 21)ODRC='1K'
      IF(ICOUNN.EQ. 33)ODRC='1K'
      IF(ICOUNN.EQ.  3)ODRC='1H'
      IF(ICOUNN.EQ. 31)ODRC='1H'
      IF(ICOUNN.EQ. 37)ODRC='1H'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.'18')THEN
      ODRC='5H'
      IF(ICOUNN.EQ. 19)ODRC='3F'
      IF(ICOUNN.EQ. 25)ODRC='3F'
      IF(ICOUNN.EQ. 27)ODRC='3F'
      IF(ICOUNN.EQ. 37)ODRC='3F'
      IF(ICOUNN.EQ. 43)ODRC='3F'
      IF(ICOUNN.EQ. 51)ODRC='3F'
      IF(ICOUNN.EQ. 61)ODRC='3F'
      IF(ICOUNN.EQ. 77)ODRC='3F'
      IF(ICOUNN.EQ. 83)ODRC='3F'
      IF(ICOUNN.EQ.101)ODRC='3F'
      IF(ICOUNN.EQ.117)ODRC='3F'
      IF(ICOUNN.EQ.123)ODRC='3F'
      IF(ICOUNN.EQ.125)ODRC='3F'
      IF(ICOUNN.EQ.129)ODRC='3F'
      IF(ICOUNN.EQ.143)ODRC='3F'
      IF(ICOUNN.EQ.147)ODRC='3F'
      IF(ICOUNN.EQ.155)ODRC='3F'
      IF(ICOUNN.EQ.163)ODRC='3F'
      IF(ICOUNN.EQ.173)ODRC='3F'
      IF(ICOUNN.EQ.175)ODRC='3F'
      IF(ICOUNN.EQ. 39)ODRC='5M'
      IF(ICOUNN.EQ. 89)ODRC='5M'
      IF(ICOUNN.EQ. 91)ODRC='5M'
      IF(ICOUNN.EQ. 99)ODRC='5M'
      IF(ICOUNN.EQ.127)ODRC='5M'
      IF(ICOUNN.EQ.141)ODRC='5M'
      IF(ICOUNN.EQ.149)ODRC='5M'
      IF(ICOUNN.EQ. 29)ODRC='5B'
      IF(ICOUNN.EQ. 49)ODRC='5B'
      IF(ICOUNN.EQ.115)ODRC='5B'
      IF(ICOUNN.EQ.137)ODRC='5B'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.'51')THEN
      ODRC='3K'
      IF(ICOUNN.EQ.  1)ODRC='1B'
      IF(ICOUNN.EQ. 43)ODRC='1B'
      IF(ICOUNN.EQ. 59)ODRC='1B'
      IF(ICOUNN.EQ. 61)ODRC='1B'
      IF(ICOUNN.EQ. 69)ODRC='1B'
      IF(ICOUNN.EQ.107)ODRC='1B'
      IF(ICOUNN.EQ.131)ODRC='1B'
      IF(ICOUNN.EQ.153)ODRC='1B'
      IF(ICOUNN.EQ.171)ODRC='1B'
      IF(ICOUNN.EQ.187)ODRC='1B'
      IF(ICOUNN.EQ. 21)ODRC='3B'
      IF(ICOUNN.EQ. 27)ODRC='3B'
      IF(ICOUNN.EQ. 35)ODRC='3B'
      IF(ICOUNN.EQ. 71)ODRC='3B'
      IF(ICOUNN.EQ. 77)ODRC='3B'
      IF(ICOUNN.EQ.155)ODRC='3B'
      IF(ICOUNN.EQ.173)ODRC='3B'
      IF(ICOUNN.EQ.185)ODRC='3B'
      IF(ICOUNN.EQ.197)ODRC='3B'
      IF(ICOUNN.EQ. 51)ODRC='3I'
      IF(ICOUNN.EQ.105)ODRC='3I'
      IF(ICOUNN.EQ.167)ODRC='3I'
      IF(ICOUNN.EQ.169)ODRC='3I'
      IF(ICOUNN.EQ.191)ODRC='3I'
      IF(ICOUNN.EQ.195)ODRC='3I'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.'24')THEN
      ODRC='1B'
      IF(ICOUNN.EQ.  1)ODRC='1L'
      IF(ICOUNN.EQ. 23)ODRC='1L'
      GOTO230
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      ENDIF
      IF(ISTAN.EQ.'25')THEN
         ODRC='1C'
           IF(ICOUNN.EQ.  3)ODRC='1F'
           IF(ICOUNN.EQ. 11)ODRC='1F'
           IF(ICOUNN.EQ. 13)ODRC='1F'
           IF(ICOUNN.EQ. 15)ODRC='1F'
         GOTO230
      ENDIF
      IF(ISTAN.EQ.'45')THEN
         ODRC='3D'
           IF(ICOUNN.EQ. 21)ODRC='3C'
           IF(ICOUNN.EQ. 23)ODRC='3C'
           IF(ICOUNN.EQ. 25)ODRC='3C'
           IF(ICOUNN.EQ. 57)ODRC='3C'
           IF(ICOUNN.EQ. 91)ODRC='3C'
         GOTO230
      ENDIF
      IF(ISTAN.EQ.'29')THEN
         ODRC='4G'
           IF(ICOUNN.EQ.  7)ODRC='5N'
           IF(ICOUNN.EQ. 17)ODRC='5N'
           IF(ICOUNN.EQ. 19)ODRC='5N'
           IF(ICOUNN.EQ. 23)ODRC='5N'
           IF(ICOUNN.EQ. 27)ODRC='5N'
           IF(ICOUNN.EQ. 29)ODRC='5N'
           IF(ICOUNN.EQ. 31)ODRC='5N'
           IF(ICOUNN.EQ. 35)ODRC='5N'
           IF(ICOUNN.EQ. 45)ODRC='5N'
           IF(ICOUNN.EQ. 51)ODRC='5N'
           IF(ICOUNN.EQ. 55)ODRC='5N'
           IF(ICOUNN.EQ. 65)ODRC='5N'
           IF(ICOUNN.EQ. 71)ODRC='5N'
           IF(ICOUNN.EQ. 73)ODRC='5N'
           IF(ICOUNN.EQ. 91)ODRC='5N'
           IF(ICOUNN.EQ. 93)ODRC='5N'
           IF(ICOUNN.EQ. 99)ODRC='5N'
           IF(ICOUNN.EQ.103)ODRC='5N'
           IF(ICOUNN.EQ.105)ODRC='5N'
           IF(ICOUNN.EQ.111)ODRC='5N'
           IF(ICOUNN.EQ.113)ODRC='5N'
           IF(ICOUNN.EQ.123)ODRC='5N'
           IF(ICOUNN.EQ.125)ODRC='5N'
           IF(ICOUNN.EQ.127)ODRC='5N'
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           IF(ICOUNN.EQ.133)ODRC='5N'
           IF(ICOUNN.EQ.135)ODRC='5N'
           IF(ICOUNN.EQ.137)ODRC='5N'
           IF(ICOUNN.EQ.139)ODRC='5N'
           IF(ICOUNN.EQ.143)ODRC='5N'
           IF(ICOUNN.EQ.149)ODRC='5N'
           IF(ICOUNN.EQ.151)ODRC='5N'
           IF(ICOUNN.EQ.157)ODRC='5N'
           IF(ICOUNN.EQ.161)ODRC='5N'
           IF(ICOUNN.EQ.163)ODRC='5N'
           IF(ICOUNN.EQ.169)ODRC='5N'
           IF(ICOUNN.EQ.173)ODRC='5N'
           IF(ICOUNN.EQ.179)ODRC='5N'
           IF(ICOUNN.EQ.181)ODRC='5N'
           IF(ICOUNN.EQ.183)ODRC='5N'
           IF(ICOUNN.EQ.187)ODRC='5N'
           IF(ICOUNN.EQ.189)ODRC='5N'
           IF(ICOUNN.EQ.193)ODRC='5N'
           IF(ICOUNN.EQ.199)ODRC='5N'
           IF(ICOUNN.EQ.201)ODRC='5N'
           IF(ICOUNN.EQ.203)ODRC='5N'
           IF(ICOUNN.EQ.205)ODRC='5N'
           IF(ICOUNN.EQ.207)ODRC='5N'
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           IF(ICOUNN.EQ.219)ODRC='5N'
           IF(ICOUNN.EQ.221)ODRC='5N'
           IF(ICOUNN.EQ.223)ODRC='5N'
           IF(ICOUNN.EQ. 69)ODRC='4F'
           IF(ICOUNN.EQ.155)ODRC='4F'
         GOTO230
      ENDIF
      IF(ISTAN.EQ.' 1')GOTO212
 212  IF(ISTAN.EQ.'01')THEN
         ODRC='3H'
           IF(ICOUNN.EQ. 33)ODRC='3I'
           IF(ICOUNN.EQ. 59)ODRC='3I'
           IF(ICOUNN.EQ. 71)ODRC='3I'
           IF(ICOUNN.EQ. 77)ODRC='3I'
           IF(ICOUNN.EQ. 79)ODRC='3I'
           IF(ICOUNN.EQ. 83)ODRC='3I'
           IF(ICOUNN.EQ. 89)ODRC='3I'
           IF(ICOUNN.EQ. 95)ODRC='3I'
           IF(ICOUNN.EQ.103)ODRC='3I'
         GOTO230
      ENDIF
      IF(ISTAN.EQ.'55')THEN
         ODRC='5J'
           IF(ICOUNN.EQ.  3)ODRC='5K'
           IF(ICOUNN.EQ.  5)ODRC='5K'
           IF(ICOUNN.EQ.  7)ODRC='5K'
           IF(ICOUNN.EQ. 11)ODRC='5K'
           IF(ICOUNN.EQ. 13)ODRC='5K'
           IF(ICOUNN.EQ. 17)ODRC='5K'
           IF(ICOUNN.EQ. 19)ODRC='5K'
           IF(ICOUNN.EQ. 23)ODRC='5K'
           IF(ICOUNN.EQ. 31)ODRC='5K'
           IF(ICOUNN.EQ. 35)ODRC='5K'
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           IF(ICOUNN.EQ. 63)ODRC='5K'
           IF(ICOUNN.EQ. 81)ODRC='5K'
           IF(ICOUNN.EQ. 91)ODRC='5K'
           IF(ICOUNN.EQ. 93)ODRC='5K'
           IF(ICOUNN.EQ. 95)ODRC='5K'
           IF(ICOUNN.EQ. 99)ODRC='5K'
           IF(ICOUNN.EQ.107)ODRC='5K'
           IF(ICOUNN.EQ.109)ODRC='5K'
           IF(ICOUNN.EQ.113)ODRC='5K'
           IF(ICOUNN.EQ.119)ODRC='5K'
           IF(ICOUNN.EQ.121)ODRC='5K'
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      IF(ICOUNN.EQ.123)ODRC='5K'
      IF(ICOUNN.EQ.129)ODRC='5K'
      IF(ICOUNN.EQ. 43)ODRC='5E'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.'47')THEN
      ODRC='3I'
      IF(ICOUNN.EQ.  5)ODRC='4F'
      IF(ICOUNN.EQ. 17)ODRC='4F'
      IF(ICOUNN.EQ. 23)ODRC='4F'
      IF(ICOUNN.EQ. 33)ODRC='4F'
      IF(ICOUNN.EQ. 39)ODRC='4F'
      IF(ICOUNN.EQ. 45)ODRC='4F'
      IF(ICOUNN.EQ. 47)ODRC='4F'
      IF(ICOUNN.EQ. 53)ODRC='4F'
      IF(ICOUNN.EQ. 69)ODRC='4F'
      IF(ICOUNN.EQ. 71)ODRC='4F'
      IF(ICOUNN.EQ. 75)ODRC='4F'
      IF(ICOUNN.EQ. 77)ODRC='4F'
      IF(ICOUNN.EQ. 79)ODRC='4F'
      IF(ICOUNN.EQ. 95)ODRC='4F'
      IF(ICOUNN.EQ. 97)ODRC='4F'
      IF(ICOUNN.EQ.109)ODRC='4F'
      IF(ICOUNN.EQ.113)ODRC='4F'
      IF(ICOUNN.EQ.131)ODRC='4F'
      IF(ICOUNN.EQ.157)ODRC='4F'
      IF(ICOUNN.EQ.167)ODRC='4F'
      IF(ICOUNN.EQ.183)ODRC='4F'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.'21')THEN
      ODRC='3F'
      IF(ICOUNN.EQ.  3)ODRC='3I'
      IF(ICOUNN.EQ.  9)ODRC='3I'
      IF(ICOUNN.EQ. 13)ODRC='3I'
      IF(ICOUNN.EQ. 31)ODRC='3I'
      IF(ICOUNN.EQ. 33)ODRC='3I'
      IF(ICOUNN.EQ. 47)ODRC='3I'
      IF(ICOUNN.EQ. 55)ODRC='3I'
      IF(ICOUNN.EQ. 57)ODRC='3I'
      IF(ICOUNN.EQ. 95)ODRC='3I'
      IF(ICOUNN.EQ.119)ODRC='3I'
      IF(ICOUNN.EQ.121)ODRC='3I'
      IF(ICOUNN.EQ.131)ODRC='3I'
      IF(ICOUNN.EQ.133)ODRC='3I'
      IF(ICOUNN.EQ.141)ODRC='3I'
      IF(ICOUNN.EQ.169)ODRC='3I'
      IF(ICOUNN.EQ.171)ODRC='3I'
      IF(ICOUNN.EQ.193)ODRC='3I'
      IF(ICOUNN.EQ.213)ODRC='3I'
      IF(ICOUNN.EQ.219)ODRC='3I'
      IF(ICOUNN.EQ.221)ODRC='3I'
      IF(ICOUNN.EQ.227)ODRC='3I'
      IF(ICOUNN.EQ.235)ODRC='3I'
      IF(ICOUNN.EQ. 11)ODRC='5B'
      IF(ICOUNN.EQ. 15)ODRC='5B'
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      IF(ICOUNN.EQ. 37)ODRC='5B'
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      IF(ICOUNN.EQ. 97)ODRC='5B'
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      IF(ICOUNN.EQ. 89)ODRC='3B'
      IF(ICOUNN.EQ.115)ODRC='3B'
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      IF(ICOUNN.EQ.155)ODRC='3B'
      IF(ICOUNN.EQ.165)ODRC='3B'
      IF(ICOUNN.EQ.175)ODRC='3B'
      IF(ICOUNN.EQ.195)ODRC='3B'
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      IF(ICOUNN.EQ. 39)ODRC='4F'
      IF(ICOUNN.EQ. 73)ODRC='4F'
      IF(ICOUNN.EQ. 83)ODRC='4F'
      IF(ICOUNN.EQ.105)ODRC='4F'
      IF(ICOUNN.EQ.139)ODRC='4F'
      IF(ICOUNN.EQ.143)ODRC='4F'
      IF(ICOUNN.EQ.145)ODRC='4F'
      IF(ICOUNN.EQ.157)ODRC='4F'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.'RQ')THEN
      ODRC='3L'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.'53')THEN
      ODRC='6L'
      IF(ICOUNN.EQ. 11)ODRC='6H'
      IF(ICOUNN.EQ. 15)ODRC='6H'
      IF(ICOUNN.EQ. 39)ODRC='6H'
      IF(ICOUNN.EQ. 59)ODRC='6H'
      IF(ICOUNN.EQ. 69)ODRC='6H'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.'27')THEN
      ODRC='5K'
      IF(ICOUNN.EQ.  5)ODRC='5L'
      IF(ICOUNN.EQ.  7)ODRC='5L'
      IF(ICOUNN.EQ. 11)ODRC='5L'
      IF(ICOUNN.EQ. 27)ODRC='5L'
      IF(ICOUNN.EQ. 29)ODRC='5L'
      IF(ICOUNN.EQ. 33)ODRC='5L'
      IF(ICOUNN.EQ. 41)ODRC='5L'
      IF(ICOUNN.EQ. 51)ODRC='5L'
      IF(ICOUNN.EQ. 57)ODRC='5L'
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      IF(ICOUNN.EQ. 63)ODRC='5L'
      IF(ICOUNN.EQ. 69)ODRC='5L'
      IF(ICOUNN.EQ. 73)ODRC='5L'
      IF(ICOUNN.EQ. 77)ODRC='5L'
      IF(ICOUNN.EQ. 81)ODRC='5L'
      IF(ICOUNN.EQ. 87)ODRC='5L'
      IF(ICOUNN.EQ. 89)ODRC='5L'
      IF(ICOUNN.EQ.101)ODRC='5L'
      IF(ICOUNN.EQ.105)ODRC='5L'
      IF(ICOUNN.EQ.107)ODRC='5L'
      IF(ICOUNN.EQ.111)ODRC='5L'
      IF(ICOUNN.EQ.113)ODRC='5L'
      IF(ICOUNN.EQ.117)ODRC='5L'
      IF(ICOUNN.EQ.119)ODRC='5L'
      IF(ICOUNN.EQ.121)ODRC='5L'
      IF(ICOUNN.EQ.125)ODRC='5L'
      IF(ICOUNN.EQ.133)ODRC='5L'
      IF(ICOUNN.EQ.135)ODRC='5L'
      IF(ICOUNN.EQ.149)ODRC='5L'
      IF(ICOUNN.EQ.155)ODRC='5L'
      IF(ICOUNN.EQ.159)ODRC='5L'
      IF(ICOUNN.EQ.167)ODRC='5L'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.' 4')GOTO213
   IF(ISTAN.EQ.'04')THEN
213   ODRC='6G'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.'22')THEN
      ODRC='4H'
      IF(ICOUNN.EQ.  1)ODRC='4I'
      IF(ICOUNN.EQ.  5)ODRC='4I'
      IF(ICOUNN.EQ.  7)ODRC='4I'
      IF(ICOUNN.EQ. 33)ODRC='4I'
      IF(ICOUNN.EQ. 37)ODRC='4I'
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      IF(ICOUNN.EQ. 47)ODRC='4I'
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      IF(ICOUNN.EQ. 55)ODRC='4I'
      IF(ICOUNN.EQ. 57)ODRC='4I'
      IF(ICOUNN.EQ. 63)ODRC='4I'
      IF(ICOUNN.EQ. 71)ODRC='4I'
      IF(ICOUNN.EQ. 75)ODRC='4I'
      IF(ICOUNN.EQ. 77)ODRC='4I'
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      IF(ICOUNN.EQ. 93)ODRC='4I'
      IF(ICOUNN.EQ. 95)ODRC='4I'
      IF(ICOUNN.EQ. 97)ODRC='4I'
      IF(ICOUNN.EQ. 99)ODRC='4I'
      IF(ICOUNN.EQ.101)ODRC='4I'
      IF(ICOUNN.EQ.103)ODRC='4I'
      IF(ICOUNN.EQ.105)ODRC='4I'
      IF(ICOUNN.EQ.109)ODRC='4I'
      IF(ICOUNN.EQ.113)ODRC='4I'
      IF(ICOUNN.EQ.117)ODRC='4I'
      IF(ICOUNN.EQ.121)ODRC='4I'
      IF(ICOUNN.EQ.126)ODRC='4I'
      IF(ICOUNN.EQ.  3)ODRC='4E'
      IF(ICOUNN.EQ. 11)ODRC='4E'
      IF(ICOUNN.EQ. 19)ODRC='4E'
      IF(ICOUNN.EQ. 23)ODRC='4E'
      IF(ICOUNN.EQ. 53)ODRC='4E'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.' 9')GOTO214
   IF(ISTAN.EQ.'09')THEN
214   ODRC='1F'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.'28')THEN
      ODRC='4F'
      IF(ICOUNN.EQ. 45)ODRC='4I'
      IF(ICOUNN.EQ. 47)ODRC='4I'
      IF(ICOUNN.EQ. 59)ODRC='4I'
      IF(ICOUNN.EQ.109)ODRC='4I'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.' 8')GOTO215
   IF(ISTAN.EQ.'08')THEN
215   ODRC='4D'
      GOTO230
   ENDIF
   IF(ISTAN.EQ.'19')THEN
      ODRC='5E'
      IF(ICOUNN.EQ.  1)ODRC='5L'
      IF(ICOUNN.EQ.  9)ODRC='5L'
      IF(ICOUNN.EQ. 21)ODRC='5L'
      IF(ICOUNN.EQ. 27)ODRC='5L'
      IF(ICOUNN.EQ. 29)ODRC='5L'
      IF(ICOUNN.EQ. 35)ODRC='5L'
      IF(ICOUNN.EQ. 43)ODRC='5L'
      IF(ICOUNN.EQ. 47)ODRC='5L'
      IF(ICOUNN.EQ. 59)ODRC='5L'
      IF(ICOUNN.EQ. 71)ODRC='5L'
      IF(ICOUNN.EQ. 85)ODRC='5L'
      IF(ICOUNN.EQ. 93)ODRC='5L'
      IF(ICOUNN.EQ.119)ODRC='5L'
      IF(ICOUNN.EQ.129)ODRC='5L'
      IF(ICOUNN.EQ.133)ODRC='5L'
      IF(ICOUNN.EQ.137)ODRC='5L'
      IF(ICOUNN.EQ.141)ODRC='5L'
      IF(ICOUNN.EQ.143)ODRC='5L'
      IF(ICOUNN.EQ.145)ODRC='5L'
      IF(ICOUNN.EQ.149)ODRC='5L'
      IF(ICOUNN.EQ.155)ODRC='5L'
      IF(ICOUNN.EQ.161)ODRC='5L'
      IF(ICOUNN.EQ.165)ODRC='5L'
      IF(ICOUNN.EQ.167)ODRC='5L'
      IF(ICOUNN.EQ.173)ODRC='5L'
      IF(ICOUNN.EQ.193)ODRC='5L'
      GOTO230
```

```
      ENDIF
      IF(ISTAN.EQ.'54')THEN
          ODRC='3B'
              IF(ICOUNN.EQ.  9)ODRC='1L'
              IF(ICOUNN.EQ. 17)ODRC='1L'
              IF(ICOUNN.EQ. 23)ODRC='1L'
              IF(ICOUNN.EQ. 27)ODRC='1L'
              IF(ICOUNN.EQ. 29)ODRC='1L'
              IF(ICOUNN.EQ. 31)ODRC='1L'
              IF(ICOUNN.EQ. 33)ODRC='1L'
              IF(ICOUNN.EQ. 41)ODRC='1L'
              IF(ICOUNN.EQ. 49)ODRC='1L'
              IF(ICOUNN.EQ. 51)ODRC='1L'
              IF(ICOUNN.EQ. 57)ODRC='1L'
              IF(ICOUNN.EQ. 61)ODRC='1L'
              IF(ICOUNN.EQ. 69)ODRC='1L'
              IF(ICOUNN.EQ. 71)ODRC='1L'
              IF(ICOUNN.EQ. 77)ODRC='1L'
              IF(ICOUNN.EQ. 83)ODRC='1L'
              IF(ICOUNN.EQ. 91)ODRC='1L'
              IF(ICOUNN.EQ. 93)ODRC='1L'
              IF(ICOUNN.EQ. 95)ODRC='1L'
              IF(ICOUNN.EQ. 97)ODRC='1L'
              IF(ICOUNN.EQ.103)ODRC='1L'
              IF(ICOUNN.EQ. 73)ODRC='5D'
              IF(ICOUNN.EQ. 85)ODRC='5D'
              IF(ICOUNN.EQ.105)ODRC='5D'
              IF(ICOUNN.EQ.107)ODRC='5D'
              IF(ICOUNN.EQ.  3)ODRC='1B'
              IF(ICOUNN.EQ. 37)ODRC='1B'
              IF(ICOUNN.EQ. 65)ODRC='1B'
              GOTO230
      ENDIF
      IF(ISTAN.EQ.' 5')GOTO216
      IF(ISTAN.EQ.'05')THEN
216       ODRC='4H'
              IF(ICOUNN.EQ. 21)ODRC='4F'
              IF(ICOUNN.EQ. 31)ODRC='4F'
              IF(ICOUNN.EQ. 35)ODRC='4F'
              IF(ICOUNN.EQ. 37)ODRC='4F'
              IF(ICOUNN.EQ. 55)ODRC='4F'
              IF(ICOUNN.EQ. 77)ODRC='4F'
              IF(ICOUNN.EQ. 93)ODRC='4F'
              IF(ICOUNN.EQ.107)ODRC='4F'
              IF(ICOUNN.EQ.111)ODRC='4F'
              IF(ICOUNN.EQ.123)ODRC='4F'
              GOTO230
      ENDIF
      IF(ISTAN.EQ.'41')THEN
          ODRC='6H'
              IF(ICOUNN.EQ.  1)ODRC='6J'
              IF(ICOUNN.EQ. 23)ODRC='6J'
              IF(ICOUNN.EQ. 25)ODRC='6J'
              IF(ICOUNN.EQ. 45)ODRC='6J'
              IF(ICOUNN.EQ. 61)ODRC='6J'
              IF(ICOUNN.EQ. 63)ODRC='6J'
              GOTO230
      ENDIF
      IF(ISTAN.EQ.'40')THEN
          ODRC='4J'
          IF(ICOUNN.EQ.  1)ODRC='4H'
          IF(ICOUNN.EQ. 75)ODRC='4H'
          IF(ICOUNN.EQ.135)ODRC='4H'
          GOTO230
      ENDIF
      IF(ISTAN.EQ.'23')THEN
          ODRC='1D'
          GOTO230
      ENDIF
      IF(ISTAN.EQ.'35')THEN
          ODRC='4A'
          GOTO230
      ENDIF
      IF(ISTAN.EQ.'33')THEN
          ODRC='1D'
          GOTO230
      ENDIF
      IF(ISTAN.EQ.'20')THEN
          ODRC='4G'
          IF(ICOUNN.EQ. 23)ODRC='4D'
          IF(ICOUNN.EQ. 39)ODRC='4D'
          IF(ICOUNN.EQ. 55)ODRC='4D'
          IF(ICOUNN.EQ. 63)ODRC='4D'
          IF(ICOUNN.EQ. 71)ODRC='4D'
          IF(ICOUNN.EQ. 75)ODRC='4D'
          IF(ICOUNN.EQ. 93)ODRC='4D'
          IF(ICOUNN.EQ.101)ODRC='4D'
          IF(ICOUNN.EQ.109)ODRC='4D'
          IF(ICOUNN.EQ.153)ODRC='4D'
          IF(ICOUNN.EQ.171)ODRC='4D'
          IF(ICOUNN.EQ.179)ODRC='4D'
          IF(ICOUNN.EQ.181)ODRC='4D'
          IF(ICOUNN.EQ.193)ODRC='4D'
          IF(ICOUNN.EQ.199)ODRC='4D'
          IF(ICOUNN.EQ.203)ODRC='4D'
          IF(ICOUNN.EQ. 67)ODRC='4J'
          IF(ICOUNN.EQ. 81)ODRC='4J'
          IF(ICOUNN.EQ.119)ODRC='4J'
          IF(ICOUNN.EQ.129)ODRC='4J'
          IF(ICOUNN.EQ.175)ODRC='4J'
          IF(ICOUNN.EQ.187)ODRC='4J'
          IF(ICOUNN.EQ.189)ODRC='4J'
          GOTO230
      ENDIF
      IF(ISTAN.EQ.'31')THEN
          ODRC='5L'
          IF(ICOUNN.EQ.  5)ODRC='4D'
          IF(ICOUNN.EQ.  7)ODRC='4D'
          IF(ICOUNN.EQ. 13)ODRC='4D'
          IF(ICOUNN.EQ. 29)ODRC='4D'
          IF(ICOUNN.EQ. 33)ODRC='4D'
          IF(ICOUNN.EQ. 45)ODRC='4D'
          IF(ICOUNN.EQ. 49)ODRC='4D'
          IF(ICOUNN.EQ. 57)ODRC='4D'
          IF(ICOUNN.EQ. 69)ODRC='4D'
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      IF(ICOUNN.EQ. 75)ODRC='4D'
      IF(ICOUNN.EQ. 85)ODRC='4D'
      IF(ICOUNN.EJ. 87)ODRC='4D'
      IF(ICOUNN.EQ.101)ODRC='4D'
      IF(ICOUNN.EQ.105)ODRC='4D'
      IF(ICOUNN.EQ.123)ODRC='4D'
      IF(ICOUNN.EQ.135)ODRC='4D'
      IF(ICOUNN.EQ.145)ODRC='4D'
      IF(ICOUNN.EQ.157)ODRC='4D'
      IF(ICOUNN.EQ.161)ODRC='4D'
      IF(ICOUNN.EQ.165)ODRC='4D'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'15')THEN
      ODRC='6E'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'49')THEN
      ODRC='6J'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'10')THEN
      ODRC='1B'
      IF(ICOUNN.EQ.  3)ODRC='1K'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'44')THEN
      ODRC='1C'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'11')THEN
      ODRC='1B'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'16')THEN
      ODRC='6J'
      IF(ICOUNN.EQ.  9)ODRC='6L'
      IF(ICOUNN.EQ. 17)ODRC='6L'
      IF(ICOUNN.EQ. 21)ODRC='6L'
      IF(ICOUNN.EQ. 35)ODRC='6L'
      IF(ICOUNN.EQ. 49)ODRC='6L'
      IF(ICOUNN.EQ. 55)ODRC='6L'
      IF(ICOUNN.EQ. 57)ODRC='6L'
      IF(ICOUNN.EQ. 61)ODRC='6L'
      IF(ICOUNN.EQ. 69)ODRC='8L'
      IF(ICOUNN.EQ. 79)ODRC='6L'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'46')THEN
      ODRC='5L'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'30')THEN
      ODRC='6J'
      IF(ICOUNN.EQ. 53)ODRC='6L'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'32')THEN
      ODRC='6I'
      IF(ICOUNN.EQ.  7)ODRC='6J'
      IF(ICOUNN.EQ. 11)ODRC='6J'
      IF(ICOUNN.EQ. 13)ODRC='6J'
      IF(ICOUNN.EQ. 15)ODRC='6J'
      IF(ICOUNN.EQ. 17)ODRC='6J'
      IF(ICOUNN.EQ. 33)ODRC='6J'
      IF(ICOUNN.EQ.  3)ODRC='6G'
      IF(ICOUNN.EQ.  9)ODRC='6G'
      IF(ICOUNN.EQ. 23)ODRC='6G'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'50')THEN
      ODRC='1A'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'GQ')THEN
      ODRC='6E'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'38')THEN
      ODRC='5L'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'56')THEN
      ODRC='4D'
      IF(ICOUNN.EQ. 23)ODRC='6J'
      IF(ICOUNN.EQ. 35)ODRC='6J'
      IF(ICOUNN.EQ. 37)ODRC='6J'
      IF(ICOUNN.EQ. 39)ODRC='6J'
      IF(ICOUNN.EQ. 41)ODRC='6J'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.' 2')GOTO217
217 IF(ISTAN.EQ.'02')THEN
      ODRC='6E'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'AQ')THEN
      ODRC='6E'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'RP')THEN
      ODRC='6E'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'VQ')THEN
      ODRC='3L'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'CA')THEN
      ODRC='1N'
      GOTO230
    ENDIF
    IF(ISTAN.EQ.'GE')THEN
      ODRC='1B'
      GOTO230
```

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      ENDIF
      IF(ISTAN.EQ.'PN')THEN
          ODRC='3D'
          GOTO230
      ENDIF
      IF(ISTAN.EQ.'IT')THEN
          ODRC='1B'
      ENDIF
230   OEDCER=1
      IF(IEDCER.EQ.' ')THEN
          OEDCER=0
          GOTO240
      ENDIF
      IF(IEDCER.EQ.'3')THEN
          OEDCER=2
          GOTO240
      ENDIF
      IF(IEDCER.EQ.'S')THEN
          OEDCER=3
          GOTO240
      ENDIF
      IF(IEDCER.EQ.'2')THEN
          OEDCER=4
          GOTO240
      ENDIF
      IF(IEDCER.EQ.'A')THEN
          OEDCER=5
          GOTO240
      ENDIF
      IF(IEDCER.EQ.'D')THEN
          OEDCER=5
          GOTO240
      ENDIF
      IF(IEDCER.EQ.'G')THEN
          OEDCER=6
          GOTO240
      ENDIF
      IF(IEDCER.EQ.'K')THEN
          OEDCER=7
          GOTO240
      ENDIF
      IF(IEDCER.EQ.'N')THEN
          OEDCER=8
          GOTO240
      ENDIF
      IF(IEDCER.EQ.'R')THEN
          OEDCER=8
          GOTO240
      ENDIF
      IF(IEDCER.EQ.'U')THEN
          OEDCER=8
          GOTO240
      ENDIF
      IF(IEDCER.EQ.'W')OEDCER=9
240   IF(OEDCER.EQ.0)THEN
          IF(IYRSED.GE. 8)OEDCER=1
          IF(IYRSED.GE.12)OEDCER=4
          IF(IYRSED.GE.13)OEDCER=5
          IF(IYRSED.GE.14)OEDCER=6
          IF(IYRSED.GE.16)OEDCER=7
          IF(IYRSED.GE.18)OEDCER=8
      ENDIF
      ODATE=IDATE(1)
      DO 250 I=2,10
          IF(IDATE(I).LT.7000)GOTO250
          IF(IDATE(I).LT.ODATE)ODATE=IDATE(I)
250   CONTINUE
      OAGE=0
      IF(IBIRTH.GE.2000)THEN
          IF(IBIRTH.LE.ODATE)THEN
              IOTEST=ODATE-((ODATE/100)*100)
              IBTEST=IBIRTH-((IBIRTH/100)*100)
              OAGE=(ODATE-IBIRTH-88)/100
              IF(IOTEST.GE.IBTEST)OAGE=(ODATE-IBIRTH)/100
          ENDIF
      ENDIF
      OSEX=0
      IF(ISEX.EQ.'F')OSEX=1
      ORACE=0
      IF(IRACE.EQ.'X')ORACE=0
      IF(IRACE.EQ.'R')ORACE=1
      IF(IRACE.EQ.'N')ORACE=2
      IF(IRACE.EQ.'C')ORACE=3
      IF(IRACE.EQ.'M')ORACE=4
      IF(IETHNI.EQ.'1')GOTO255
      IF(IETHNI.EQ.'4')GOTO255
      IF(IETHNI.EQ.'6')GOTO255
      IF(IETHNI.EQ.'9')GOTO255
      IF(IETHNI.EQ.'S')GOTO255
      OHISP=0
      GOTO260
255   OHISP=1
260   OMARI=1
      IF(IMARI.EQ.'S')OMARI=0
      IF(IMARI.EQ.'M')OMARI=2
      IF(IMARI.EQ.'J')OMARI=2
280   OPRIOR=0
      IF(IPRIOR.EQ.'Y')OPRIOR=1
330   WRITE(2,2) ODATE,ODRC,OSTATC,OSERV,OSERVC,OPRIOR,
     -    IMCAT,IAFQT,OEDCER,OAGE,OSEX,
     -    ORACE,OHISP,OMARI
2     FORMAT(I4,A2,I1,I1,I1,I1,
     -        A2,A2,I1,I2,I1,
     -        I1,I1,I1)
      GOTO10
100   PRINT *,'TOTAL RECS=',K
999   STOP
      END
-END OF INFORMATION-
```

Appendix C-19

FORTRAN Program for Merging MEPS Data with USAREC Data

```
      PROGRAM MERGE
      CHARACTER UDRC2,UQMA*3,UMHSSR*3,
     +    UUNEMP*3,UARDOD*3,UDODNP*4,
     +    UDHSMA*4,UINCOM*5,UBLACK*3,
     +    ADRC2,ASTAT,AREST*24,
     +    TQMA(840)*3,TMHSSR(840)*3,
     +    TUNEMP(840)*3,TARDOD(840)*3,
     +    TDODNP(840)*4,TDHSMA(840)*4,
     +    TINCOM(840)*5,TBLACK(840)*3
      INTEGER UYEAR,UQTR,UDRC1,TDRC2,TINDEX,
     +    ASERV,ADRC1,AYEAR,AMONTH,AQTR
      OPEN(1,FILE='USAREC')
      OPEN(2,FILE='RECODE')
      OPEN(3,FILE='MERGE')
      K=0
10    READ(1,1)UYEAR,UQTR,UDRC1,UDRC2,
     +    UQMA,UMHSSR,UUNEMP,UARDOD,
     +    UDODNP,UDHSMA,UINCOM,UBLACK
1     FORMAT(I2,1X,I1,I1,A1,
     +       7X,A3,7X,A3,15X,A3,3X,A3,
     +       2X,A4,2X,A4,A5,2X,A3,31X)
      IF(UYEAR.EQ.79)GOTO30
      IF(UYEAR.EQ.80)GOTO30
      IF(UYEAR.EQ.81)GOTO30
      IF(UYEAR.EQ.82)GOTO100
      GOTO10
30    TDRC2=0
      IF(UDRC2.EQ.'A')TDRC2=1
      IF(UDRC2.EQ.'B')TDRC2=2
      IF(UDRC2.EQ.'C')TDRC2=3
      IF(UDRC2.EQ.'D')TDRC2=4
      IF(UDRC2.EQ.'E')TDRC2=5
      IF(UDRC2.EQ.'F')TDRC2=6
      IF(UDRC2.EQ.'G')TDRC2=7
      IF(UDRC2.EQ.'H')TDRC2=8
      IF(UDRC2.EQ.'I')TDRC2=9
      IF(UDRC2.EQ.'J')TDRC2=10
      IF(UDRC2.EQ.'K')TDRC2=11
      IF(UDRC2.EQ.'L')TDRC2=12
      IF(UDRC2.EQ.'M')TDRC2=13
      IF(UDRC2.EQ.'N')TDRC2=14
      IF(TDRC2.EQ.0)THEN
          PRINT *,UYEAR,'0',UQTR,UDRC1,UDRC2
          GOTO10
      ENDIF
      IF(UDRC1.EQ.1)UDRC1=2
      TINDEX=((UYEAR-79)*280)+((UQTR-1)*70)
     +       +((UDRC1-2)*14)+TDRC2
      TQMA  (TINDEX)=UQMA
      TMHSSR(TINDEX)=UMHSSR
      TUNEMP(TINDEX)=UUNEMP
      TARDOD(TINDEX)=UARDOD
      TDODNP(TINDEX)=UDODNP
      TDHSMA(TINDEX)=UDHSMA
      TINCOM(TINDEX)=UINCOM
      TBLACK(TINDEX)=UBLACK
      GOTO10
100   READ(2,2,END=999) AYEAR,AMONTH,
     +    ADRC1,ADRC2,ASTAT,ASERV,AREST
2     FORMAT(I2,I2,I1,A1,A1,I1,A13)
      IF(ADRC2.NE.' ')GOTO120
      PRINT *,'BLANK DRC',AYEAR,AMONTH,
     +    ADRC1,ADCR2,ASTAT,ASERV,AREST
      GOTO100
120   IF(AYEAR.EQ.79)GOTO130
      IF(AYEAR.EQ.80)GOTO130
      IF(AYEAR.EQ.81)GOTO130
      PRINT *,'BAD YEAR ',AYEAR,AMONTH,
     +    ADRC1,ADRC2,ASTAT,ASERV,AREST
      GOTO100
130   TDRC2=0
      IF(ADRC2.EQ.'A')TDRC2=1
      IF(ADRC2.EQ.'B')TDRC2=2
      IF(ADRC2.EQ.'C')TDRC2=3
      IF(ADRC2.EQ.'D')TDRC2=4
      IF(ADRC2.EQ.'E')TDRC2=5
      IF(ADRC2.EQ.'F')TDRC2=6
      IF(ADRC2.EQ.'G')TDRC2=7
      IF(ADRC2.EQ.'H')TDRC2=8
      IF(ADRC2.EQ.'I')TDRC2=9
      IF(ADRC2.EQ.'J')TDRC2=10
      IF(ADRC2.EQ.'K')TDRC2=11
      IF(ADRC2.EQ.'L')TDRC2=12
      IF(ADRC2.EQ.'M')TDRC2=13
      IF(ADRC2.EQ.'N')TDRC2=14
      IF(TDRC2.NE.0)GOTO150
      PRINT *,'BAD DRC ',AYEAR,AMONTH,
     +    ADRC1,ADRC2,ASTAT,ASERV,AREST
      GOTO100
150   K=K+1
      IF(ADRC1.EQ.1)ADRC1=2
      AQTR=(INT(AMONTH-1))/3
      TINDEX=((AYEAR-79)*280)+(AQTR*70)
     +       +((ADRC1-2)*14)+TDRC2
      IF(ADRC1.EQ.2)ADRC1=1
      WRITE(3,3)AYEAR,AMONTH,ADRC1,
     +    ADRC2,ASTAT,ASERV,AREST,
     +    TQMA(TINDEX),TMHSSR(TINDEX),
     +    TUNEMP(TINDEX),TARDOD(TINDEX),
     +    TDODNP(TINDEX),TDHSMA(TINDEX),
     +    TINCOM(TINDEX),TBLACK(TINDEX)
3     FORMAT(I2,I2,I1,A1,A1,I1,A13,A3,
     +       A3,A3,A3,A4,A4,A5,A3)
      GOTO100
999   PRINT *,'TOTAL MERGE RECORDS = ',K
      STOP
      END
```

Appendix D-1

ACC13AM Periodogram Values

I	FQ	P	INTNCTY
1	.012	81.000	63278274.377
2	.025	40.500	5235330.593
3	.037	27.000	1719816.276
4	.049	20.250	3579549.389
5	.062	16.200	1719448.891
6	.074	13.500	2411507.427
7	.086	11.571	491409.172
8	.099	10.125	1010286.102
9	.111	9.000	338492.184
10	.123	8.100	584928.807
11	.136	7.364	439576.592
12	.148	6.750	139719.083
13	.160	6.231	2423098.524
14	.173	5.786	508393.976
15	.185	5.400	451279.683
16	.198	5.063	1370008.043
17	.210	4.765	1522421.170
18	.222	4.500	879073.980
19	.235	4.263	1210166.804
20	.247	4.050	118707.781
21	.259	3.857	65231.805
22	.272	3.682	861240.958
23	.284	3.522	768999.175
24	.296	3.375	263136.414
25	.309	3.240	449770.928
26	.321	3.115	146690.001
27	.333	3.000	246641.291
28	.346	2.893	1714200.933
29	.358	2.793	354057.130
30	.370	2.700	550007.917
31	.383	2.613	102201.432
32	.395	2.531	20143.982
33	.407	2.455	200172.371
34	.420	2.382	69922.707
35	.432	2.314	272449.232
36	.444	2.250	486660.565
37	.457	2.189	290356.196
38	.469	2.132	33567.349
39	.481	2.077	95709.762
40	.494	2.025	365335.094

AVERAGE INTENSITY= 2421741.824555460

Appendix D-2

R and S Arrays at Low and High Frequencies for ACC13AM

(F(R) = ((-1)**M)*ACF(R))

R -ARRAY

K.	1	2	3	4	5	6	7	8	9	10
(-15)	-.0662	-.1382	-.0199	.0836	.0048	-.0461	-.0223	.0642	-.6101	-.0430
(-14)	.2403	-.0129	-.0235	.0253	.0295	.0108	-.0344	.0212	-.3597	-.0001
(-13)	-.2322	.0152	-.0436	-.0246	.4680	.0247	-.0617	.5678	.0912	-.1172
(-12)	.2498	.0321	.0004	-.0244	.0753	.0153	-.0511	.0357	.0591	.0143
(-11)	-.3003	.0170	.0243	.4281	.0040	.0189	.0009	.0327	.0664	-.1685
(-10)	.2904	.0102	.0216	-.0190	-.0191	-.0386	-.0364	-.0432	.0478	-.0386
(-9)	-.3159	-.0050	.0368	.0135	-.0212	.1088	.1873	-.1131	.1062	-.2351*
(-8)	.3223	-.0301	-.0194	.0447	-.2253	-.0499	.5092	-.2489	.2504*	-.0028
(-7)	-.3187	.0006	-.0197	.0017	-.2167	-.2124	.0221	-.2322*	-.0153	.0133
(-6)	.3749	.0198	.1130	.2135	-.2766	.5648	.2309*	-.0182	-.0049	.0022
(-5)	-.4424	.0216	-.0111	.2355	.3413	-.2441*	.0013	-.0206	-.0095	.0284
(-4)	.4788	.0337	-.3417	.0225	.2635*	.0132	.0166	-.0067	-.0123	-.0000
(-3)	-.5633	.0473	.1678	-.2677*	-.0194	-.0350	-.0722	.0033	-.0141	-.0195
(-2)	.5892	-.0620	.3341*	.0042	-.0212	-.0097	-.0223	.0192	-.0218	.0339
(-1)	-.7131	-.2869*	-.0664	.0207	.1793	.0529	.0004	.0196	.1821	0.0000
(0)	1.0000*	-.0471	-.0354	.0155	.0616	-.0449	-.0197	-.0126	.3326	0.0000
(1)	-.7131	.0418	.0097	-.0027	.0557	.3807	-.0179	-.1758	0.0000	0.0000
(2)	.5892	.0305	-.0147	-.0512	.0460	.0124	-.0242	.0692	0.0000	0.0000
(3)	-.5633	.0191	.1807	.0617	.0031	.0134	.0642	0.0000	0.0000	0.0000
(4)	.4788	.0175	.0286	-.0135	-.0156	.0068	.0173	0.0000	0.0000	0.0000
(5)	-.4424	.0005	.0274	.0117	-.0545	-.0331	0.0000	0.0000	0.0000	0.0000
(6)	.3749	-.0278	-.0127	.1043	-.3027	.0502	0.0000	0.0000	0.0000	0.0000
(7)	-.3187	-.0050	-.0123	.0516	.0120	0.0000	0.0000	0.0000	0.0000	0.0000
(8)	.3223	.0097	-.0007	.0499	-.0402	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	-.3159	.0174	-.0507	-.0755	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	.2904	.0299	.0361	-.3423	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	-.3003	.0133	.0543	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	.2498	-.0127	.0984	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	-.2322	-.0897	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	.2403	-.0045	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	-.0662	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	.0240	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

B-ARRAY

K	0	1	2	3	4	5	6	7	8	9
(-15)	1.0000	-4.6304	1.7825	.8182	1.4626	9.0176	6.2997	-3.6373	-1.2764	-14.5869
(-14)	1.0000	-1.9664	4.5822	-2.0970	1.7380	-5.1035	-6.7021	2.0930	36.5369	-16.3310
(-13)	1.0000	-2.0758	-2.4428	-.8808	-.3429	-5.2218	2.6429	1.3751	13.0280	-16.3107
(-12)	1.0000	-2.8024	.8723	48.9299	6.2237	-6.9327	-8.0292	-13.9824	46.2884	16.0474
(-11)	1.0000	-1.9668	.8931	-.3361	7.3189	-33.5653	13.6532	-546.1599	129.9085	19.4942
(-10)	1.0000	-2.0879	3.0120	-7.0078	5.7880	-.2695	13.6397	-55.9791	-69.7411	-49.2046
(-9)	1.0000	-2.0203	-9.9214	-3.3883	-2.4160	-12.2116	9.1132	-43.0768	-40.2558	-31.3126x
(-8)	1.0000	-1.9888	2.2172	-1.0416	-1.2691	-6.2631	-25.0646	-33.5122	-23.0735x	-1.9184x
(-7)	1.0000	-2.1765	-74.4504	1.3200	164.7045	-7.7063	35.0310	344.2572x	1.8077x	-2.2684
(-6)	1.0000	-2.1798	-.1960	1.3401	-2.5312	-8.5734	36.4005x	-1.9613x	3.3321	3.8724
(-5)	1.0000	-2.0824	-1.2206	-24.5088	6.8906	-25.4152x	1.9726x	25.1629	4.1242	2.9831
(-4)	1.0000	-2.1764	-.8203	-7.6177	111.5166x	-1.8712x	2.1687	-6.1060	9.9813	-3.8957
(-3)	1.0000	-2.0460	5.1092	-8.6383x	1.7429x	-.5953	1.1405	-6.6716	-27.1322	-3.9032
(-2)	1.0000	-2.2102	-8.7145x	-1.7160x	-6.3392	-1.5760	9.6588	-5.6802	-7.1600	-7.3869
(-1)	1.0000	-2.4024x	1.4316x	-1.6079	.1668	-1.4911	5.5855	-293.0024	.7894	-8.7625
(0)	1.0000x	-1.7131x	3.4472	-.6689	2.0937	-3.0207	5.5384	-.4806	-10.6087	0.0000
(1)	1.0000x	-1.8263	.5295	-1.7822	-37.7213	-.5848	5.2524	-.8200	9.4583	0.0000
(2)	1.0000	-1.9560	.6913	-2.1107	3.3347	-5.4285	-2.3256	-6.7870	0.0000	0.0000
(3)	1.0000	-1.8500	.1589	-1.5127	5.8197	-27.2094	1.8554	-14.1006	0.0000	0.0000
(4)	1.0000	-1.9239	1.7974	-4.7724	4.4928	-3.7747	19.2927	0.0000	0.0000	0.0000
(5)	1.0000	-1.8476	109.6355	-2.4129	-1.5160	-3.3010	9.2203	0.0000	0.0000	0.0000
(6)	1.0000	-1.8500	1.6495	-.1910	-.7243	-3.6621	0.0000	0.0000	0.0000	0.0000
(7)	1.0000	-2.0113	5.8289	1.43[illegible]	3.5228	-19.0406	0.0000	0.0000	0.0000	0.0000
(8)	1.0000	-1.9801	-1.5206	-104.7282	4.3679	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	1.0000	-1.9192	-1.4598	-1.7374	6.6927	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	1.0000	-2.0343	1.0147	1.8944	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	1.0000	-1.8317	3.7614	-10.0433	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	1.0000	-1.8295	-12.3646	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	1.0000	-2.0348	1.2110	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	1.0000	-1.2755	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	1.0000	-1.3628	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(F(R) = ACF(R))

R -ARRAY

R	1	2	3	4	5	6	7	8	9	10
(-15)	.0662	-.2433	-.5001	-.2074	-3.8833	-8.6763	-.6088	.4323	-2.1617	-.6163
(-14)	.2403	-.7553	.9015	-.2088	1.4589	-.2326	-.2762	-.1717	-2.6112	.0015
(-13)	.2322	.4170	.2862	-.3154	-1.2613	.4587	-.4904	2.2432	1.4793	-1.5175
(-12)	.2498	-.3496	-.0065	-.3054	-.7184	-1.0428	-.8398	-.8536	4.6442	.2698
(-11)	.3003	-1.0596	.3199	.7925	.4768	-5.2699	.0225	-.8303	3.1880	3.5714
(-10)	.2904	-.2430	3.0261	.5814	.9942	.4886	.8383	-11.6724	1.6964	.6656
(-9)	.3159	-.5000	-3.2661	.2406	.0899	.4018	.0332	-2.0443	-12.7860	-2.7182*
(-8)	.3223	-5.3473	.2438	-.1236	-1.8405	.1200	.7048	-2.8268	2.5622*	-.0324
(-7)	.3187	.0069	.2295	-.0131	-1.6224	-.6778	-.2790	-2.3761*	.1570	-.2285
(-6)	.3749	-.2396	.0820	1.9592	-.5866	-1.0388	2.3897*	-.1862	-.5894	-.0462
(-5)	.4424	.5464	.0435	.8578	1.0666	-2.5266*	-.0136	-.1843	.3370	.5383
(-4)	.4788	-.4163	-1.0069	-.1719	2.3533*	.1369	.2095	-.1209	.5926	-.0004
(-3)	.5633	2.1009	5.9129	-2.3907*	.1733	.0643	.1127	.8968	1.1092	.2525
(-2)	.5892	.0520	1.9945*	.0374	.1223	-.0308	.1112	-.4867	.3536	.4861
(-1)	.7131	-1.7131*	.3062	-.1581	-.1200	-.1271	.0087	-.4692	-1.3223	0.0000
(0)	1.0000*	-.2214	1.2480	.0565	-.3863	-.1645	.4739	-.0498	-1.1784	0.0000
(1)	.7131	-.4399	-.0275	-.0249	-.4553	-.1982	.2935	1.4274	0.0000	0.0000
(2)	.5892	1.3560	-.0578	.3890	.1948	-3.4474	.1921	.5517	0.0000	0.0000
(3)	.5633	-.2358	-.1310	-.1706	.1608	-.9176	-.5154	0.0000	0.0000	0.0000
(4)	.4788	.4431	.3333	-.2420	1.8712	.1270	-.4716	0.0000	0.0000	0.0000
(5)	.4424	-.0058	.3434	-.3569	-.5193	.7122	0.0000	0.0000	0.0000	0.0000
(6)	.3749	-.3427	-1.1590	.1930	-.8158	9.4487	0.0000	0.0000	0.0000	0.0000
(7)	.3187	-.8890	1.7196	.6450	-.5925	0.0000	0.0000	0.0000	0.0000	0.0000
(8)	.3223	.9675	.0092	.6394	-33.6284	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	.3159	-.4137	-.6563	.6235	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	.2904	-1.7733	.2372	.8492	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	.3003	-.1452	2.0873	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	.2498	-.3469	-2.4782	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	.2322	-5.2396	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	.2403	-.0080	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	.0662	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	.0240	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

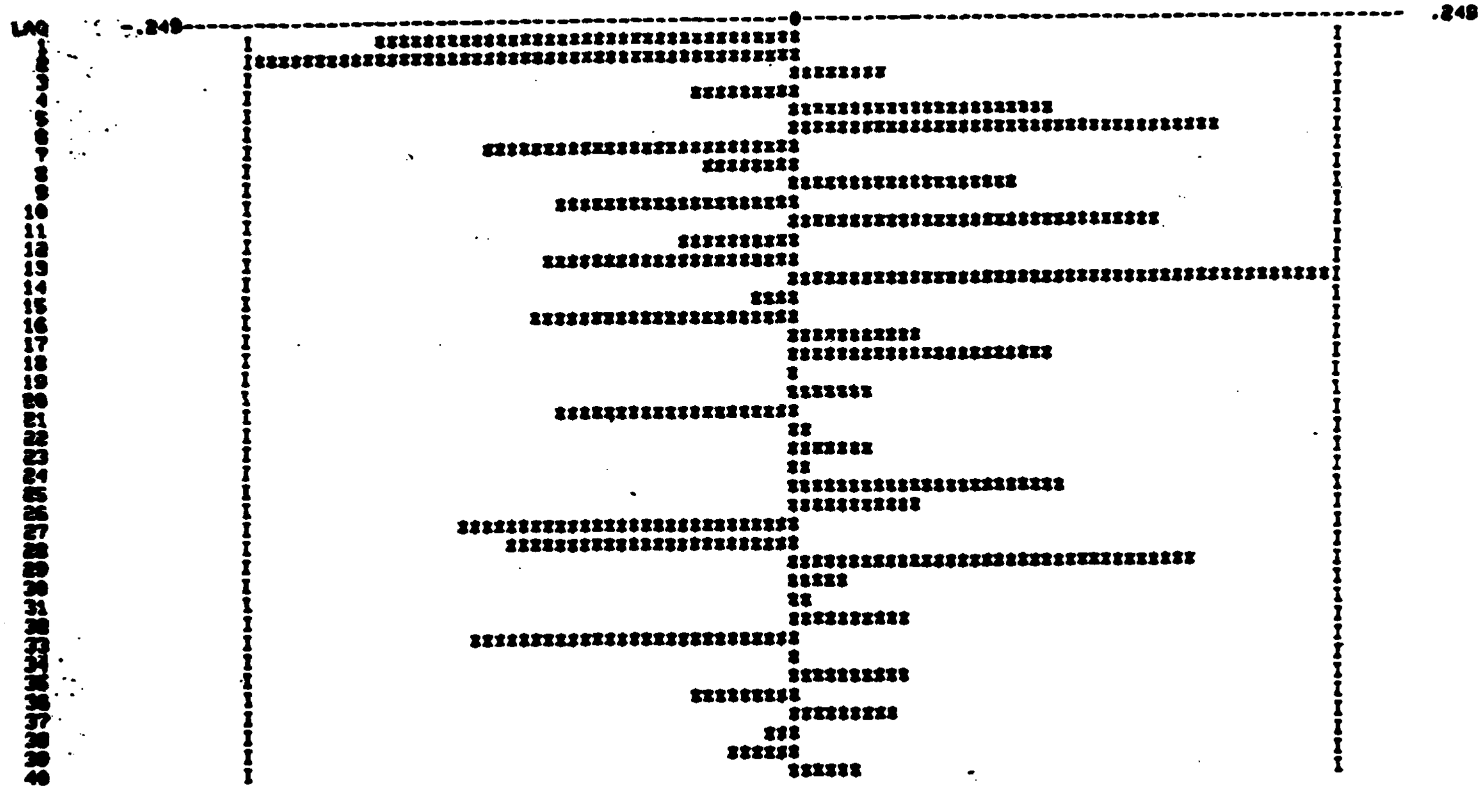
B-ARRAY

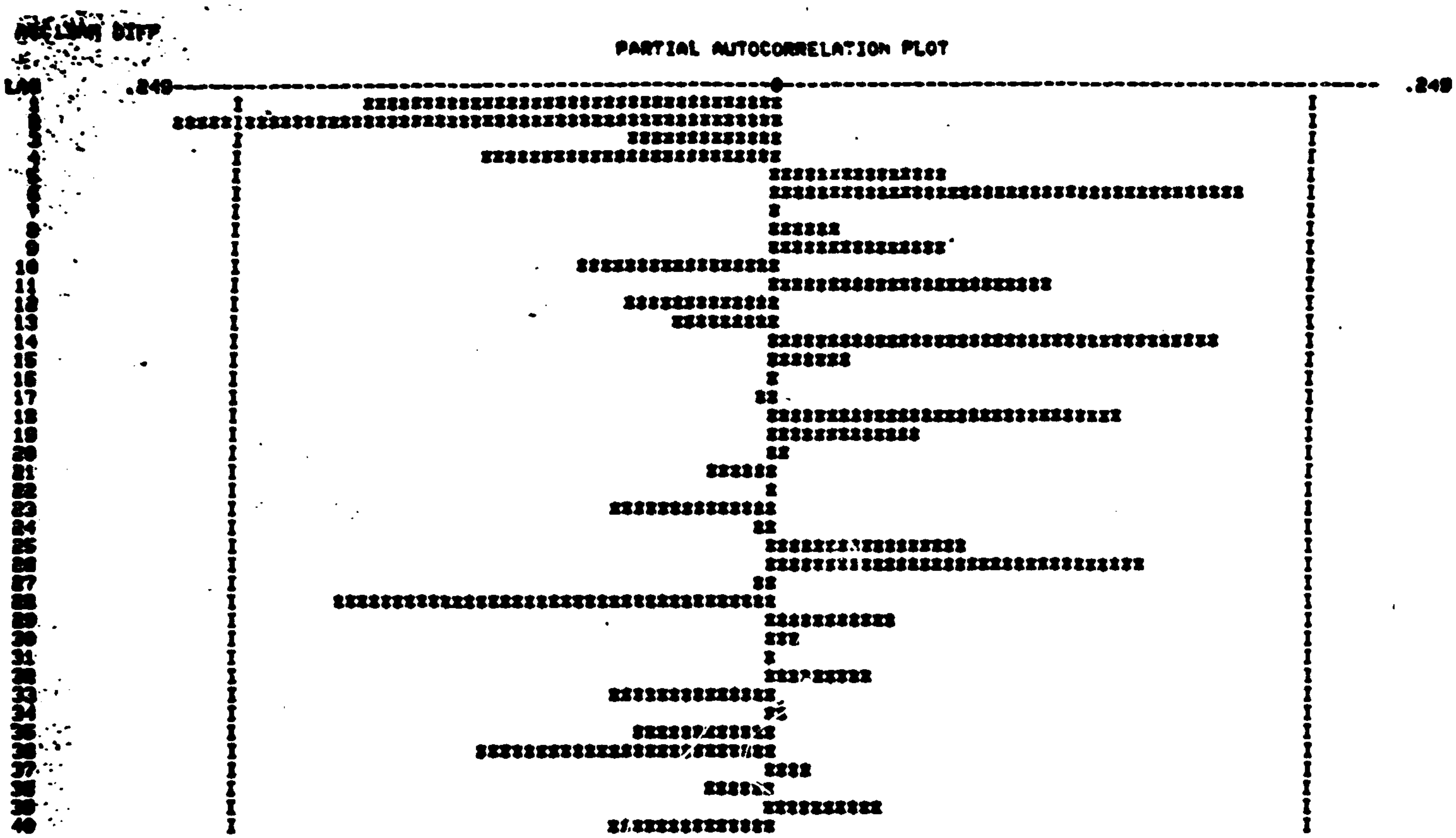
	0	1	2	3	4	5	6	7	8	9
(-15)	1.0000	2.6304	-.0708	.3298	.0017	-.0400	-.2309	.4563	.3602	1.0178
(-14)	1.0000	-.0336	-.1177	.2540	.0361	.2372	-.0362	-.2578	4.0946	1.2580
(-13)	1.0000	.0758	-.3721	.0687	-.1278	.2810	-.3323	-.3481	-.8031	1.2593
(-12)	1.0000	.0824	-.0674	3.9053	-.6527	.1015	-.4087	.5817	.5886	.8478
(-11)	1.0000	-.0332	-.0678	.1816	-.0610	-.1206	-.5665	-21.5038	-2.7038	.9195
(-10)	1.0000	.0879	.0215	.2291	-.1111	.6185	-.5926	-.2070	-1.9653	2.8555
(-9)	1.0000	.0803	-.1085	.1895	-.5700	3.3359	-1.8291	2.3826	-.3345	2.7068x
(-8)	1.0000	-.0112	-.1767	.3766	-.1554	2.6077	-16.0594	-3.7457	-2.2549x	-.1658x
(-7)	1.0000	.1765	-6.3942	.1738	-22.0039	2.4149	2.7725	-33.6438x	.1767x	-.1316
(-6)	1.0000	.1798	-.2703	.1460	-3.7826	5.2061	3.5171x	-.1917x	.0277	-.1827
(-5)	1.0000	.0624	-.3108	6.7287	-1.1959	2.4557x	.1906x	-2.8125	.1162	-.1576
(-4)	1.0000	.1764	-.2784	.9063	12.4876x	-.1808x	.1716	-.3377	-.2077	-.3008
(-3)	1.0000	.0460	-.1450	.9673x	.1952x	-.3237	.7307	.0247	-.3450	-.3007
(-2)	1.0000	.2102	-1.4597x	-.1922x	1.1002	-.4939	-1.9386	.2236	.4413	-.5154
(-1)	1.0000	.4024x	.2398x	-.2103	.2493	-.6208	-.2427	-12.2596	.1087	-.3259
(0)	1.0000x	-.2869x	-.0978	-.1836	-.2797	-.8252	-.2298	-.1217	2.9941	0.0000
(1)	1.0000x	-.1737	.1797	.1942	-4.6178	-1.1234	.3197	-.1010	.5223	0.0000
(2)	1.0000	-.0440	.1760	.2779	.7868	.0195	.2924	-.2514	0.0000	0.0000
(3)	1.0000	-.1500	.2192	-.5469	-.1117	-.3985	.2312	.0600	0.0000	0.0000
(4)	1.0000	-.0761	.1544	-.2670	-.0375	-.2031	-.7070	0.0000	0.0000	0.0000
(5)	1.0000	-.1524	-8.7392	-.0789	.1590	-.1534	-.2389	0.0000	0.0000	0.0000
(6)	1.0000	-.1500	.0180	-.1032	-.2687	-.0195	0.0000	0.0000	0.0000	0.0000
(7)	1.0000	.0113	.0415	-.1148	.0711	.2911	0.0000	0.0000	0.0000	0.0000
(8)	1.0000	-.0199	.1154	-8.1694	.0052	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	1.0000	-.0808	.1128	-.2104	-.2763	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	1.0000	.0343	.1546	-.7636	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	1.0000	-.1683	-.0979	-1.0743	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	1.0000	-.0706	.4911	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	1.0000	.0348	.7234	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	1.0000	-.7245	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	1.0000	-.6372	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Appendix D-3

Simple and Partial Autocorrelation Plots for Differenced ACC13AM

AUTOCORRELATION PLOT




PARTIAL AUTOCORRELATION PLOT
LAG
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Appendix D-4

ACC13AM Differenced- Periodogram, R and S Arrays
(Low and High Frequencies)

I	FQ	P	INTNCTY
1	.013	80.000	425263.264
2	.025	40.000	95272.234
3	.038	26.667	142867.746
4	.050	20.000	438195.258
5	.063	16.000	389961.518
6	.075	13.333	554123.006
7	.088	11.429	117026.221
8	.100	10.000	221731.274
9	.113	8.889	276989.756
10	.125	8.000	760311.606
11	.138	7.273	360433.640
12	.150	6.667	15013.418
13	.163	6.154	2414080.402
14	.175	5.714	148209.517
15	.188	5.333	316635.120
16	.200	5.000	2424474.018
17	.213	4.706	1781752.256
18	.225	4.444	1355083.652
19	.238	4.211	1104398.989
20	.250	4.000	205641.225
21	.263	3.810	204164.037
22	.275	3.636	2536959.417
23	.288	3.478	1250784.786
24	.300	3.333	669037.054
25	.313	3.200	1046371.276
26	.325	3.077	769922.830
27	.338	2.963	270799.387
28	.350	2.857	5259793.421
29	.363	2.759	2436559.057
30	.375	2.667	1521650.649
31	.388	2.581	171317.097
32	.400	2.500	267971.656
33	.413	2.424	1334378.454
34	.425	2.353	367933.398
35	.438	2.286	1499523.795
36	.450	2.222	740633.271
37	.463	2.162	678635.032
38	.475	2.105	626430.953
39	.488	2.051	979614.676
40	.500	2.000	230584.225

AVERAGE INTENSITY= 910483.2147895396

(F(M) = ((-1)**M)*ACF(M))

R ARRAY

K	1	2	3	4	5	6	7	8	9	10
(-15)	.0218	-.8329	-.0781	.0060	-.0039	.0570	-.0922	.8021	.0606	-.8004
(-14)	.2205	.1908	.0906	.1126	.0033	.0062	-.0842	-.0114	.0556	-.4038
(-13)	.1062	.1175	-.1370	-.3636	-.1238	.0868	-.4202	-.0618	.1708	.5717
(-12)	-.0477	.1722	.1630	-1.3266	.1434	.1081	.1763	-.1048	.9380	-.8894
(-11)	-.1488	.0679	.2921	-.2419	-1.0775	.0231	.1575	.0322	1.1633	-.4024
(-10)	-.0993	-.3738	-3.4561	-.1666	.0275	-.0626	.1612	-1.0250	.6756	-9.3513
(-9)	-.0888	-.2717	.0022	-.1717	-.0345	-.1878	.1934	.0299	.6708	-.8568*
(-8)	-.0401	-.1407	.1893	.1361	.8571	-.3848	-.1408	-.8916	.9222*	.0726
(-7)	.1310	-1.0421	-.0537	.2548	-.0341	-.4012	.0011	-.8999*	-.0654	-.1010
(-6)	.1724	.0664	-.6201	1.0123	.4570	-.5899	.9001*	-.0223	-.0674	.2853
(-5)	-.1026	.0280	-.4379	-1.2048	-.8371	-.7523*	-.0002	-.0215	-.0686	-.0290
(-4)	-.0449	.9374	-.7547	-.5740	.8066*	-.1478	.0223	.0703	.0879	.0578
(-3)	-.0354	.3005	.1833	-.8206*	-.0543	-.1158	-.0000	.0082	.0765	.2258
(-2)	-.2264	-.6415	.8632*	.1140	.3575	-.0859	-.0571	-.0909	-.0333	.6002
(-1)	.1734	-1.1734*	.0574	.0815	-.0161	-.0791	-.0489	-.0295	-.1632	0.0000
(0)	1.0000*	.3102	-.0776	.5849	.0935	-.0094	-.0457	-.0038	-.1336	0.0000
(1)	.1734	.1436	-.1488	-.4618	-.0292	.0295	-.0547	.1326	0.0000	0.0000
(2)	-.2264	.0467	-.3319	-.1862	.0146	.0517	.1431	.1527	0.0000	0.0000
(3)	-.0354	-.1698	-.6623	-.0859	-.0650	.0406	-.0774	0.0000	0.0000	0.0000
(4)	-.0449	.3169	.1127	.0754	.4637	.0045	-.0702	0.0000	0.0000	0.0000
(5)	-.1026	-.1570	.0012	.0751	-.1077	.0721	0.0000	0.0000	0.0000	0.0000
(6)	.1724	.5811	-.0744	.3183	.0846	.0577	0.0000	0.0000	0.0000	0.0000
(7)	.1310	.0774	-1.1475	1.2625	-.1776	0.0000	0.0000	0.0000	0.0000	0.0000
(8)	-.0401	.0002	-.2482	.2846	.5641	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	-.0888	-.3211	-.6965	.1446	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	-.0993	.3515	.0616	.0402	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	-.1488	-.1789	-.2007	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	-.0477	-.1417	.1672	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	.1062	-.4055	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	.2205	.1236	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	.0216	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	-.1093	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

S-ARRAY

K	0	1	2	3	4	5	6	7	8	9
(-15)	1.0000	8.2142	.9428	-1.2029	-.4279	-2.1247	3.1847	3.8041	5.6301	1.8647
(-14)	1.0000	-.5182	.5572	-2.4796	1.8670	-3.5767	-43.8381	-5.3305	-24.3364	-5.1204
(-13)	1.0000	-1.4492	.8863	-.4416	1.4391	-3.3964	-1.3351	-5.4746	-2.4691	6.8835
(-12)	1.0000	2.1180	.2016	.5433	1.5734	-5.4520	3.8563	-3.5644	1.5549	11.2395
(-11)	1.0000	-.3327	.6859	-1.9242	.6404	-4.8052	33.2840	-1.1891	46.7878	2.6467
(-10)	1.0000	-.1054	.1500	-2.0589	4.7816	-8.9746	-50.4726	-1.4270	-6.3130	1.0703
(-9)	1.0000	-.5487	2.0576	156.1397	4.0061	-25.2355	-7.1393	6.1343	-149.1791	-13.8510x
(-8)	1.0000	-4.2679	2.0259	-2.2349	2.9893	-6.8028	-3.5507	4.8332	-36.9496x	-.9823x
(-7)	1.0000	.3162	1.6967	3.4285	6.0057	-83.5234	-4.7964	xxxxxxxxxxx	.9173x	.1075
(-6)	1.0000	-1.5960	.3251	2.0199	5.8032	-10.1995	-4.7876x	-.9406x	3.6028	.2686
(-5)	1.0000	-.5620	-6.8731	-2.6496	3.6019	-17.3867x	.9404x	-89.8429	14.8723	-.8489
(-4)	1.0000	-.2117	-3.6624	-6.8796	8.8547x	-1.1703x	.9417	-3.4861	.3721	-.5692
(-3)	1.0000	5.3905	5.5353	14.6657x	1.0965x	-4.3655	.7603	-.4209	4.3830	-.9995
(-2)	1.0000	-1.7658	3.9537x	-.9756x	.5743	-2.9444	1.4682	-.3608	.8960	5.7704
(-1)	1.0000	4.7686x	1.0452x	-2.9125	2.8174	-18.6453	2.5267	-1.0312	1.4815	-11.9140
(0)	1.0000x	-.8266x	1.2387	.5226	2.7398	-2.8673	15.6734	-1.6979	65.7023	0.0000
(1)	1.0000x	-2.3058	.5691	-1.5310	2.1849	-3.7900	-8.6246	-1.8148	-.5302	0.0000
(2)	1.0000	-.8435	-1.2449	-3.8613	2.5276	-11.4472	.5019	-3.4963	0.0000	0.0000
(3)	1.0000	.2685	-3.6785	-4.6908	2.0982	-2.3460	2.2693	3.4037	0.0000	0.0000
(4)	1.0000	1.2832	4.0085	-1.1175	.2885	-2.5515	-36.7950	0.0000	0.0000	0.0000
(5)	1.0000	-2.6807	1.1297	-70.6140	2.0704	-2.4451	-.9779	0.0000	0.0000	0.0000
(6)	1.0000	-.2403	1.1320	.6389	1.3695	-4.5288	0.0000	0.0000	0.0000	0.0000
(7)	1.0000	-1.3060	.0443	.4617	1.4613	-2.2932	0.0000	0.0000	0.0000	0.0000
(8)	1.0000	1.2161	-.5891	-1.8866	.5492	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	1.0000	.1178	-1.0444	-1.1158	2.6929	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	1.0000	.4986	1.0251	-3.7316	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	1.0000	-.6793	.6720	-3.1968	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	1.0000	-3.2263	2.0032	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	1.0000	1.0758	1.1770	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	1.0000	-.9021	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	1.0000	-6.0641	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(F(M) = ACF(M))

R ARRAY

M	1	2	3	4	5	6	7	8	9	10
(-15)	-.0216	-.1914	.0368	-.0667	.2178	-.0394	.4227	-.1806	.0536	.0280
(-14)	.2205	.0668	.0163	-.0680	.0411	.1751	1.5563	.0103	.0344	.0811
(-13)	-.1062	-.3091	.0460	.2300	.0399	-.4292	.0901	-.0618	-.0319	.1015
(-12)	-.0477	-.0886	.0233	.0949	.0356	-.0775	.6737	.0617	-.2281	.4577
(-11)	.1488	-.0136	.1975	.0414	.0685	-.0459	.3795	.0055	-.2090	.0410
(-10)	-.0993	-.0208	-.0601	-.0079	.0281	.3680	.2859	.2046	.7632	-.3653
(-9)	.0888	.1027	-.0012	-.0863	.0411	-.3113	-.5954	-.0390	.0648	-.6972x
(-8)	-.0401	.0648	.0063	1.4823	.2223	-.4288	-.0903	-.6412	.6510x	.0590
(-7)	-.1310	-.1423	.0793	.2161	.0292	-.4013	-.0008	-.6353x	.0462	-.0039
(-6)	.1724	.8617	-.1346	.3350	.3654	-.7326	.6351x	-.0158	.0069	-.0290
(-5)	.1026	-.0109	-.1511	.2881	.1831	-.5309x	.0001	-.0155	.0775	.0149
(-4)	-.0449	.1110	-.3836	-1.4327	.4974x	-.1043	.0158	-.0919	.0158	.0103
(-3)	.0354	.2192	-.1878	-.5577x	.0335	-.1438	.0613	-.0016	.0186	-.0454
(-2)	-.2264	-4.8372	.8081x	.0703	.0782	-.0859	-.1756	-.0154	-.0062	-.0700
(-1)	-.1734	-.8266x	-.0405	.2284	.0129	-.0884	.0867	.0174	.1010	0.0000
(0)	1.0000x	.2185	-.0795	-.1399	.0801	-.0156	.1101	-.0032	.1182	0.0000
(1)	-.1734	1.0825	.0756	-.3809	.0253	-.1686	.2089	-.1205	0.0000	0.0000
(2)	-.2264	.0341	.1145	-.1580	.0174	-.1026	.0307	-.0913	0.0000	0.0000
(3)	.0354	-.0201	.1437	-.9416	.0655	-.0292	-1.4304	0.0000	0.0000	0.0000
(4)	-.0449	-.1239	.1663	.0422	.0252	-.0222	-.3219	0.0000	0.0000	0.0000
(5)	.1026	-.6182	-.0007	.0441	.0267	2.0230	0.0000	0.0000	0.0000	0.0000
(6)	.1724	.0793	-.0428	-.0545	.0273	-.0606	0.0000	0.0000	0.0000	0.0000
(7)	-.1310	-.1457	.0200	-.0903	.0876	0.0000	0.0000	0.0000	0.0000	0.0000
(8)	-.0401	-.0303	.1578	-.1800	.2035	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	.0888	-.0179	.0894	-.0667	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	-.0993	-.0701	.0287	-.0279	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	.1488	.0828	.0564	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	-.0477	.3727	.0789	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	-.1062	-.1418	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	.2205	.1015	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	-.0216	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	-.1093	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

S-ARRAY

	0	1	2	3	4	5	6	7	8	9
(-15)	1.0000	-11.2142	1.9986	-1.7324	-1.1862	-3.0720	.6944	6.3687	-6.3655	14.0414
(-14)	1.0000	-1.4818	3.1012	5.3735	3.7871	-.1275	2.3706	5.8647	-39.3340	25.4933
(-13)	1.0000	-.5508	2.9381	-.6978	4.4636	-.6869	-6.2252	6.5366	-13.2261	-39.3416
(-12)	1.0000	-4.1190	1.4124	-7.5973	6.3412	7.6978	1.0094	6.0340	-6.3948	-21.8386
(-11)	1.0000	-1.6673	-1.0144	-11.2469	11.7942	-2.4712	-13.8160	7.0158	280.4800	25.9996
(-10)	1.0000	-1.8946	1.6227	-3.5034	4.7475	1.5692	-28.4603	7.1499	-5.5884	27.3951
(-9)	1.0000	-1.4513	3.5777	-278.5744	3.3639	15.2232	-2.3196	4.6932	103.7138	17.0214x
(-8)	1.0000	2.2679	3.5608	-.2038	3.4566	-6.0909	-5.5326	6.7285	-52.3394x	-1.2072x
(-7)	1.0000	-2.3162	1.1499	-4.0420	7.0127	83.4942	-6.7779	6644.7295x	1.2993x	-2.7609
(-6)	1.0000	-.4050	1.4981	2.4490	7.8581	-8.2128	-6.7849x	-1.3324x	-2.5048	-2.6388
(-5)	1.0000	-1.4380	19.9154	-11.0815	16.4645	24.6401x	1.3327x	138.8299	13.1652	-1.6495
(-4)	1.0000	-1.7883	-7.2080	-2.7564	14.3699x	-1.6585x	1.3308	2.6671	2.0716	-3.2068
(-3)	1.0000	-7.3905	5.4022	-23.7837x	1.7781x	3.5071	1.1847	-2.1050	-18.0252	-4.9763
(-2)	1.0000	-.2342	5.6119x	-1.5822x	2.6250	-2.9433	.4770	-2.1285	3.7280	-41.2394
(-1)	1.0000	-6.7686x	1.4835x	1.1669	3.5237	16.6940	1.4248	-1.7505	2.3946	-12.6555
(0)	1.0000x	-1.1734x	1.2089	-2.1855	3.1992	-1.7297	-6.6059	-2.0272	-74.2842	0.0000
(1)	1.0000x	.3058	1.1281	1.8562	2.5265	-.6627	-2.8576	-1.9966	-1.4142	0.0000
(2)	1.0000	-1.1565	3.6071	-4.3164	2.1224	5.7670	2.3403	5.8442	0.0000	0.0000
(3)	1.0000	-2.8685	-16.9511	.4278	2.0832	-3.2693	-.1227	6.2174	0.0000	0.0000
(4)	1.0000	-3.2832	2.7166	-1.9938	5.3121	.5160	-8.0230	0.0000	0.0000	0.0000
(5)	1.0000	.6807	1.9856	120.1582	8.3443	.0872	-6.7463	0.0000	0.0000	0.0000
(6)	1.0000	-1.7597	1.9683	-3.7342	4.2478	6.5500	0.0000	0.0000	0.0000	0.0000
(7)	1.0000	-.6940	2.5463	6.4554	2.9642	2.0153	0.0000	0.0000	0.0000	0.0000
(8)	1.0000	-3.2161	.8713	2.9823	1.5224	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	1.0000	-2.1178	-7.3173	-2.4180	-3.1233	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	1.0000	-2.4986	3.0535	5.3742	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	1.0000	-1.3207	3.7401	2.3976	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	1.0000	1.2263	4.2461	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	1.0000	-3.0758	1.8838	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	1.0000	-1.0979	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	1.0000	4.0641	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Appendix D-5

ACC13AM - BMDP Output for ARI (2,1) Model

```
ARIMA       VARIABLE IS ACC13AM.
            DFORDER IS 1.
            ARORDERS ARE '(1,2)'.
            CENTERED./

ESTIMATION   RESIDUAL = RACC./


ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

  RELATIVE CHANGE IN EACH ESTIMATE LESS THAN  .1000E-03

  VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES
                                              1
ACC13AM    RANDOM    REMOVED  1-  81  (1-B  )


PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.  T-RATIO
     1  ACC13AM       AR      1       1    -.2804      .1092     -2.57
     2  ACC13AM       AR      1       2    -.2786      .1017     -2.74

  RESIDUAL SUM OF SQUARES  =  27219117.115255
DEGREES OF FREEDOM        =              76
RESIDUAL MEAN SQUARE      =  358146.277832


ESTIMATION BY BACKCASTING METHOD

  RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN  .1000E-04

  VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES
                                              1
ACC13AM    RANDOM    REMOVED  1-  81  (1-B  )


PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.  T-RATIO
     1  ACC13AM       AR      1       1    -.2763      .0938     -2.95
     2  ACC13AM       AR      1       2    -.3269      .0937     -3.49

  RESIDUAL SUM OF SQUARES  =  27305853.812457 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM        =              76
RESIDUAL MEAN SQUARE      =  359287.550164
```

```
ACF          VARIABLE IS RACC.  MAXLAG IS 24./

NUMBER OF OBSERVATIONS              =          81
MEAN OF THE (DIFFERENCED) SERIES =      -11.4826
STANDARD ERROR OF THE MEAN          =     69.8190
T-VALUE OF MEAN (AGAINST ZERO)      =       -.1645


AUTOCORRELATIONS

  1- 12    -.03 -.03 -.09 -.05  .13  .14 -.07 -.04  .06 -.07  .13  .02
  ST.E.     .11  .11  .11  .11  .11  .11  .12  .12  .12  .12  .12  .12

  13- 24    0.0  .22 -.07 -.04  .02  .11  .03  .05 -.10  0.0  .04  .07
  ST.E.     .12  .12  .12  .13  .13  .13  .13  .13  .13  .13  .13  .13


PLOT OF SERIAL CORRELATION

            -1.0  -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG  CORR.  +----+----+----+----+----+----+----+----+----+----+
                                     I
  1  -.032                      +   XI   +
  2  -.029                      +   XI   +
  3  -.095                      +  XXI   +
  4  -.047                     +    XI    +
  5   .125                     +     IXXX +
  6   .139                     +     IXXX +
  7  -.069                     +   XXI    +
  8  -.043                     +    XI    +
  9   .065                     +     IXX  +
 10  -.067                     +   XXI    +
 11   .133                     +     IXXX +
 12   .022                     +     IX   +
 13  -.000                     +     I    +
 14   .216                     +     IXXXXX+
 15  -.071                     +   XXI    +
 16  -.037                     +    XI    +
 17  ,.021                     +     IX   +
 19   .115                     +     IXXX +
 19   .029                     +     IX   +
 20   .052                     +     IX   +
 21  -.104                     +  XXXI    +
 22  -.004                     +     I    +
 23   .037                     +     IX   +
 24   .074                     +     IXX  +
```

PACF VARIABLE IS RACC. MAXLAG IS 24./

```
NUMBER OF OBSERVATIONS              =        81
MEAN OF THE (DIFFERENCED) SERIES =      -11.4026
STANDARD ERROR OF THE MEAN          =      69.8190
T-VALUE OF MEAN (AGAINST ZERO)      =       -.1645
```

PARTIAL AUTOCORRELATIONS

```
  1- 12    -.03 -.03 -.10 -.06  .12  .14 -.06 -.02  .10 -.08  .09  .04
 ST.E.      .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11

 13- 24     .03  .23 -.05 -.03  .03  .13 -.01 -.01 -.01  .01 -.04  .07
 ST.E.      .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11
```

PLOT OF SERIAL CORRELATION

```
          -1.0 -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG  CORR. +----+----+----+----+----+----+----+----+----+----+
                                    I
  1  -.032                     +   XI    +
  2  -.030                     +   XI    +
  3  -.097                     +  XXI    +
  4  -.055                     +   XI    +
  5   .117                     +    IXXX +
  6   .139                     +    IXXX +
  7  -.063                     +  XXI    +
  8  -.024                     +   XI    +
  9   .101                     +    IXXX +
 10  -.078                     +  XXI    +
 11   .087                     +    IXX  +
 12   .040                     +    IX   +
 13   .026                     +    IX   +
 14   .232                     +    IXXXX+X
 15  -.054                     +   XI    +
 16  -.032                     +   XI    +
 17   .028                     +    IX   +
 18   .128                     +    IXXX +
 19  -.009                     +    I    +
 20  -.007                     +    I    +
 21  -.012                     +    I    +
 22   .009                     +    I    +
 23  -.040                     +   XI    +
 24   .071                     +    IXX  +
```

Appendix D-6

ACC13AM - BMDP Output for ARIMA $(2,1,0)*(1,0,0)_{14}$

```
ARIMA        VARIABLE IS ACC13AM.
              DFORDER IS 1.
              ARORDERS ARE '(1,2,14)'.
              CENTERED./
```

ESTIMATION RESIDUAL = RACC./

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN EACH ESTIMATE LESS THAN .1000E-03

VARIABLE	VAR. TYPE	MEAN	TIME	DIFFERENCES
ACC13AM	RANDOM	REMOVED	1- 81	$(1-B^{1})$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	ACC13AM	AR	1	1	-.3590	.0983	-3.65
2	ACC13AM	AR	1	2	-.2842	.0965	-2.94
3	ACC13AM	AR	1	14	.1831	.0850	2.15

```
RESIDUAL SUM OF SQUARES  =  14880064.398234
DEGREES OF FREEDOM       =               63
RESIDUAL MEAN SQUARE     =    236191.498385
```

ESTIMATION BY BACKCASTING METHOD

VARIABLE	VAR. TYPE	MEAN	TIME	DIFFERENCES
ACC13AM	RANDOM	REMOVED	1- 81	$(1-B^{1})$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	ACC13AM	AR	1	1	-.1835	.0803	-2.29
2	ACC13AM	AR	1	2	-.2429	.0786	-3.09
3	ACC13AM	AR	1	14	.2670	.0726	3.68

```
RESIDUAL SUM OF SQUARES  =  15763099.463337 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =               63
RESIDUAL MEAN SQUARE     =    250207.927989
```

```
ACF          VARIABLE IS RACC.  MAXLAG IS 24./

NUMBER OF OBSERVATIONS            =           81
MEAN OF THE (DIFFERENCED) SERIES  =     -11.1227
STANDARD ERROR OF THE MEAN        =      68.1453
T-VALUE OF MEAN (AGAINST ZERO)    =       -.1632


AUTOCORRELATIONS

  1- 12    -.05 -.03 -.10 -.04  .10  .19 -.02 -.09  .06 -.07  .13 -.03
  ST.E.     .11  .11  .11  .11  .11  .11  .12  .12  .12  .12  .12  .12

  13- 24   -.01 -.02  .03  .01  .03  .11  .04  .02 -.09  .02  0.0  .09
  ST.E.     .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .12


PLOT OF SERIAL CORRELATION

            -1.0 -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG  CORR.  +----+----+----+----+----+----+----+----+----+----+
                                      I
 1   -.048                       +  XI    +
 2   -.027                       +  XI    +
 3   -.105                       + XXXI   +
 4   -.040                       +  XI    +
 5    .104                       +    IXXX +
 6    .193                       +    IXXXXX+
 7   -.022                       +   XI    +
 8   -.092                       +  XXI    +
 9    .057                       +    IX   +
10   -.073                       +  XXI    +
11    .132                       +    IXXX +
12   -.025                       +   XI    +
13   -.006                       +    I    +
14   -.020                       +   XI    +
15    .030                       +    IX   +
16    .009                       +    I    +
17    .025                       +    IX   +
18    .112                       +    IXXX +
19    .036                       +    IX   +
20    .023                       +    IX   +
21   -.086                       +  XXI    +
22    .019                       +    I    +
23    .002                       +    I    +
24    .087                       +    IXX  +
```

```
PACF         VARIABLE IS RACC.  MAXLAG IS 24./

NUMBER OF OBSERVATIONS              =          81
MEAN OF THE (DIFFERENCED) SERIES    =    -11.1227
STANDARD ERROR OF THE MEAN          =     68.1453
T-VALUE OF MEAN (AGAINST ZERO)      =      -.1632


PARTIAL AUTOCORRELATIONS

  1- 12    -.05 -.03 -.11 -.05  .09  .19  0.0 -.07  .10 -.07  .07 -.05
 ST.E.      .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11

 13- 24     .01  .01  .02  .01  0.0  .13  .08  .01 -.06  .01 -.01  .02
 ST.E.      .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11


PLOT OF SERIAL CORRELATION

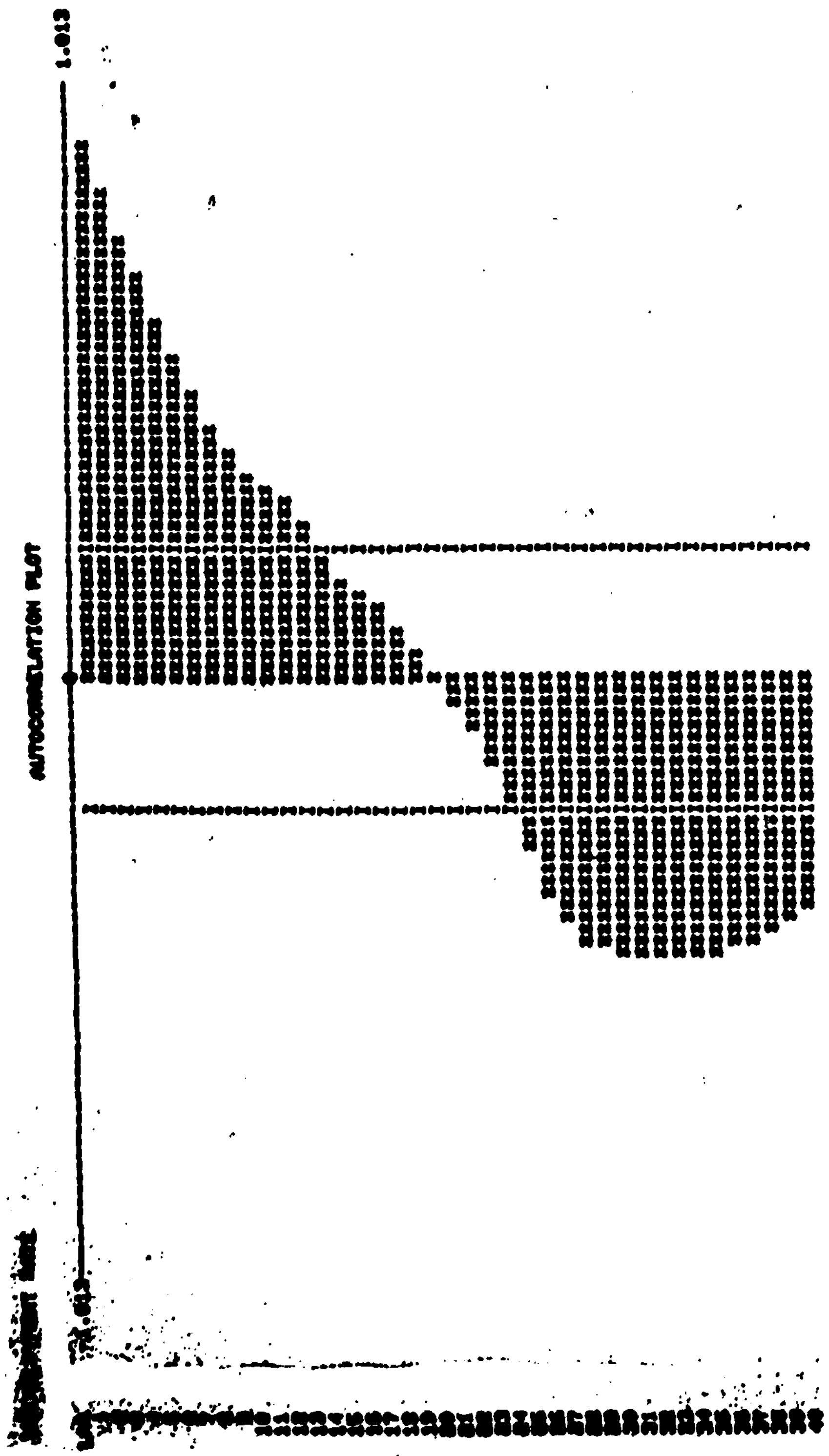
          -1.0  -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG  CORR. +----+----+----+----+----+----+----+----+----+----+
                                    I
  1  -.048                     +  II    +
  2  -.029                     +  II    +
  3  -.108                     + XXXI   +
  4  -.053                     +  XI    +
  5   .094                     +    IXX +
  6   .195                     +    IXXXXX
  7  -.002                     +    I   +
  8  -.071                     +  XXI   +
  9   .097                     +    IXX +
 10  -.067                     +  XXI   +
 11   .075                     +    IXX +
 12  -.045                     +   XI   +
 13   .008                     +    I   +
 14   .007                     +    I   +
 15   .015                     +    I   +
 16   .013                     +    I   +
 17   .002                     +    I   +
 18   .129                     +    IXXX +
 19   .085                     +    IXX +
 20   .010                     +    I   +
 21  -.059                     +   XI   +
 22   .011                     +    I   +
 23  -.007                     +    I   +
 24   .017                     +    I   +
```

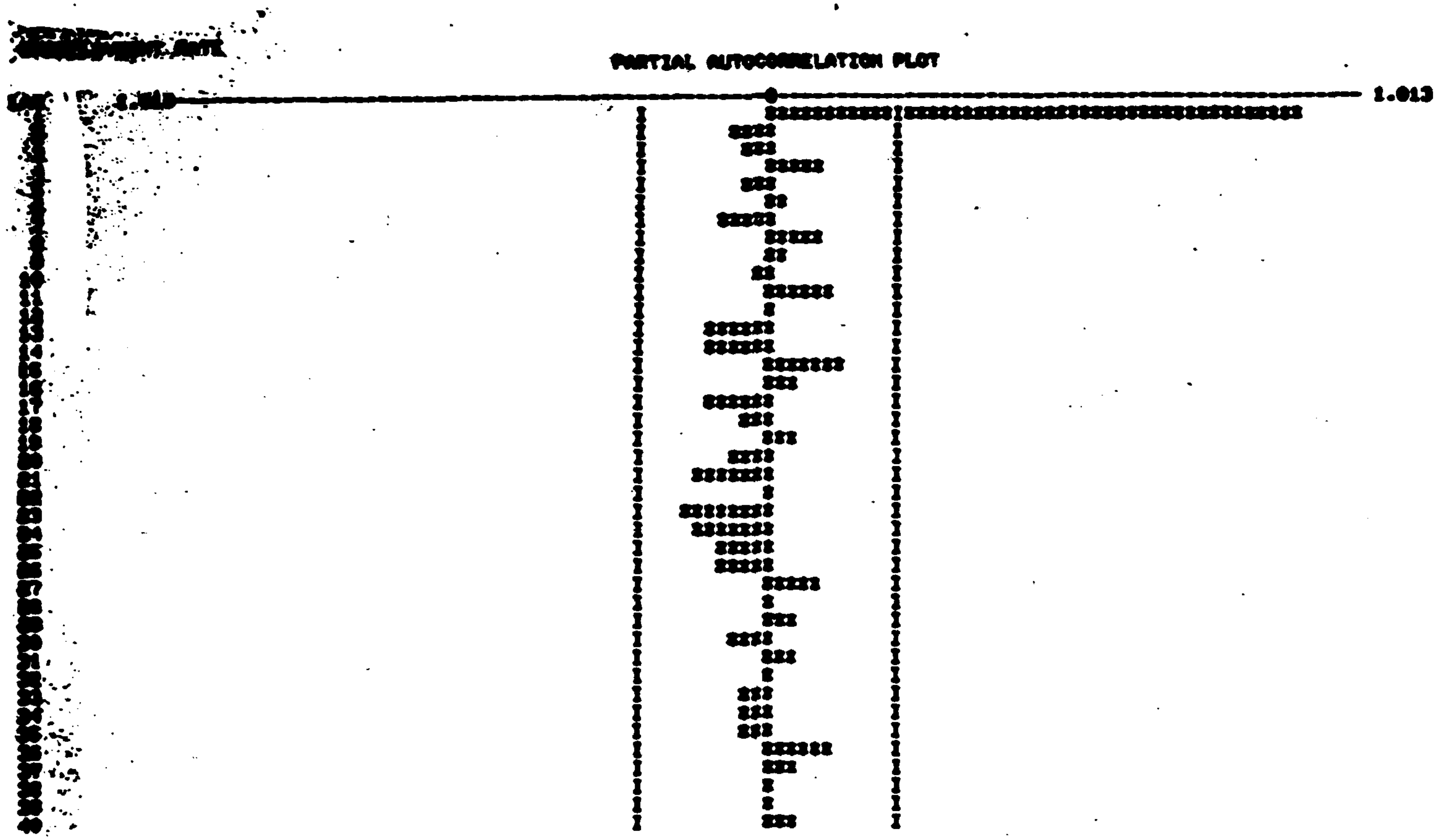
Appendix E-1

TSP Output for Raw Unemployment Rate Data

F	F0	P	INTNCTY
1	.012	81.000	80.217
2	.025	40.500	.101
3	.037	27.000	2.300
4	.049	20.250	6.083
5	.062	16.200	2.312
6	.074	13.500	.400
7	.086	11.571	1.010
8	.099	10.125	.085
9	.111	9.000	.100
10	.123	8.100	.201
11	.136	7.364	.085
12	.148	6.750	.010
13	.160	6.231	.240
14	.173	5.786	.202
15	.185	5.400	.122
16	.198	5.063	.001
17	.210	4.765	.024
18	.222	4.500	.042
19	.235	4.263	.000
20	.247	4.050	.130
21	.259	3.857	.077
22	.272	3.682	.040
23	.284	3.522	.023
24	.296	3.375	.044
25	.309	3.240	.050
26	.321	3.115	.079
27	.333	3.000	.022
28	.346	2.893	.077
29	.358	2.793	.000
30	.370	2.700	.026
31	.383	2.613	.023
32	.395	2.531	.001
33	.407	2.455	.033
34	.420	2.382	.010
35	.432	2.314	.000
36	.444	2.250	.068
37	.457	2.189	.011
38	.469	2.132	.122
39	.481	2.077	.038
40	.494	2.025	.005

AVERAGE INTENSITY= 2.0007400220


AUTOCORRELATION PLOT
1.013


PARTIAL AUTOCORRELATION PLOT
1.013

(F(M) = ((-1)**M)*ACF(M))

R -ARRAY

K	1	2	3	4	5	6	7	8	9	10
(-15)	-.1688	.0059	-.0306	.0005	-.0021	.0029	.0036	-.0059	.0309	-.0437
(-14)	.2036	.0134	.0046	.0022	-.0178	-.0011	.0058	-.0284	-1.5084	-.0014
(-13)	-.2585	-.0100	-.0064	.0030	.0053	-.0055	.0012	-.0288	-.0594	-.0467
(-12)	.2978	-.0003	-.0060	-.0074	-.0142	-.0069	.0262	.1847	.0846	-.0028
(-11)	-.3218	.0062	-.0006	-.0068	.0093	-.0130	.0009	-.1136	.0645	.0000
(-10)	.3482	.0011	.0154	-.0041	.0123	-.2113	1.0129	.0452	.0456	-.1509
(-9)	-.3897	.0007	.0057	-.0115	.0157	-.0611	.4619	-.0945	.0147	-.1087*
(-8)	.4339	-.0052	.0183	-.0077	.0682	-2.9656	.1361	.4086	.1039*	.0039
(-7)	-.4845	-.0088	.0042	-.0044	.0642	.1931	.1182	-.0970*	-.0012	.0014
(-6)	.5521	-.0023	.0010	.0038	.0737	.0966	.0886*	-.0069	-.0036	.0162
(-5)	-.6102	-.0037	.0046	-.0653	-.2339	-.0863*	.0084	.0355	-.0082	-.0129
(-4)	.6792	-.0054	.2058	-.2873	.0821*	-.0023	.0089	-.0038	-.0049	.0004
(-3)	-.7482	-.0057	.0306	-.0765*	.0042	-.0153	.0153	.0140	.0061	.0068
(-2)	.8356	.0072	.0724*	-.0056	-.0032	-.0217	.0429	-.0179	-.0180	.0083
(-1)	-.9210	-.0790*	.0042	-.0094	.0211	.0028	.1109	.0140	-.2416	0.0000
(0)	1.0000*	.0066	.0050	.0004	.0212	-.0408	.0253	.0164	-.0045	0.0000
(1)	-.9210	-.0052	-.0201	-.0224	.0276	.1788	-.0013	.0195	0.0000	0.0000
(2)	.8356	-.0048	-.0008	-.0198	.0377	-.0127	-.0157	.0076	0.0000	0.0000
(3)	-.7482	-.0033	.0171	-.0141	-.0098	-.0062	-.0031	0.0000	0.0000	0.0000
(4)	.6792	-.0020	.0090	-.0024	-.0043	-.0016	-.0043	0.0000	0.0000	0.0000
(5)	-.6102	-.0079	-.0083	.0055	.0224	.0021	0.0000	0.0000	0.0000	0.0000
(6)	.5521	-.0046	-.0009	.0064	-.0061	.0100	0.0000	0.0000	0.0000	0.0000
(7)	-.4845	.0006	.0070	.0086	.0112	0.0000	0.0000	0.0000	0.0000	0.0000
(8)	.4339	.0010	-.0069	.0051	-.0076	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	-.3897	.0056	.0086	.0009	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	.3482	-.0003	.0095	.0059	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	-.3218	-.0089	-.0084	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	.2978	.0111	.0103	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	-.2585	.0047	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	.2036	-.0037	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	-.1688	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	.1468	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

B-ARRAY

K	0	1	2	3	4	5	6	7	8	9
(-15)	1.0000	-2.0002	-2.3150	-4.3178	-14.0368	-8.3740	9.7575	-8.0050	5.0458	86.1040
(-14)	1.0000	-2.0007	3.7520	-4.0311	-1.0030	-7.0291	-81.7665	1.5600	-.0235	85.0006
(-13)	1.0000	-2.1588	2.0007	-3.1500	5.4182	-5.5544	-8.0412	-30.3657	-87.0012	87.4742
(-12)	1.0000	-2.0003	47.0553	-1.0008	1.5098	-7.0008	-1.0072	3.0015	-10.4385	-84.7613
(-11)	1.0000	-2.0022	1.7453	-80.0233	4.0581	-1.9407	1.7248	12.0706	-15.0300	10.8473
(-10)	1.0000	-2.1198	.7708	-11.5008	-5.5798	.1189	1.0646	10.0042	-36.0006	12.0016
(-9)	1.0000	-2.1133	18.1815	-3.0502	.4013	-1.4045	-90.0057	11.0608	-10.1346	-180.0044*
(-8)	1.0000	-2.1166	-1.4646	-1.0000	-.4211	-.3513	-16.0067	3.5846	~~-10.02108*~~	-1.4293*
(-7)	1.0000	-2.1306	1.5655	1.0016	6.0337	15.8730	-80.7250	16.01848*	1.41058*	2.1584
(-6)	1.0000	-2.1063	-1.3360	-3.0540	105.0057	57.4830	-63.00062*	-1.52108*	1.0640	1.0505
(-5)	1.0000	-2.1131	-.0585	-5.0309	-13.7691	33.74718*	1.00051*	-.8710	1.4970	-1.0024
(-4)	1.0000	-2.1016	-.1360	-4.0521	-84.97832*	-1.72593*	-4.5462	-1.3514	4.7171	-6.0580
(-3)	1.0000	-2.1167	4.7587	34.04862*	1.81182*	-.7830	-1.0953	-1.0125	3.0564	-7.2587
(-2)	1.0000	-2.1082	84.00002*	-1.06183*	.4485	-4.5480	-.5580	-1.3429	8.0073	-4.1004
(-1)	1.0000	-2.00572*	2.08178*	.0605	.0031	.1159	-.8487	-1.1264	-.0074	-4.0803
(0)	1.0000*	-1.02102*	3.3055	-.5004	35.5088	.5606	1.4594	-1.7488	4.0066	0.0000
(1)	1.0000*	-1.0072	.1152	-.5090	1.8743	-.2700	1.0059	80.9590	3.1537	0.0000
(2)	1.0000	-1.0055	.5937	-16.3506	-.7391	-1.5550	1.0304	-5.1720	0.0000	0.0000
(3)	1.0000	-1.0077	.7374	2.5841	1.2335	-3.5707	6.4494	7.5334	0.0000	0.0000
(4)	1.0000	-1.0984	-6.4445	-1.4823	6.3459	-8.7287	18.7929	0.0000	0.0000	0.0000
(5)	1.0000	-1.0047	.7703	-1.9058	1.4086	-8.0951	-19.3350	0.0000	0.0000	0.0000
(6)	1.0000	-1.0776	2.1484	9.3329	6.3571	-5.2550	0.0000	0.0000	0.0000	0.0000
(7)	1.0000	-1.0956	-1.1050	17.0308	1.5552	-9.9628	0.0000	0.0000	0.0000	0.0000
(8)	1.0000	-1.0983	-6.0006	-4.5171	5.9408	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	1.0000	-1.0936	2.0144	-7.0021	-44.0339	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	1.0000	-1.0241	-63.0616	-7.0752	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	1.0000	-1.0256	4.1897	-2.0962	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	1.0000	-1.0679	1.0285	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	1.0000	-1.7876	3.2810	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	1.0000	-1.0290	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	1.0000	-1.0696	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(F(R) = ACF(R))

R -ARRAY

K	1	2	3	4	5	6	7	8	9	10
(-15)	.1882	.0806	.1182	.0219	.0506	.0369	.3423	-.0399	-.3152	-.2162
(-14)	.2036	-.1186	.4632	-.0951	-.0890	.0244	.0708	-.0030	.2048	.0057
(-13)	.2585	-.1407	-.1528	.0515	-.2983	-.1035	-.0048	-.1077	.3041	-.3364
(-12)	.2878	.0074	-.1086	.0003	.0967	-8.5865	.0097	-.3594	-8.0606	-1.5018
(-11)	.3218	.1570	-.0078	.1053	.1014	-.0490	-.3627	-.3540	.0979	-.0052
(-10)	.3482	-.0194	-.0630	.0537	.0597	-.8874	1.2246	-.1760	.4035	-1.2883
(-9)	.3897	.0129	-.1303	-.0705	.0334	.1138	.0034	-.0029	-.3397	-1.7002x
(-8)	.4339	.0061	.0791	.1009	.1859	-.0675	7.3882	-.7010	1.0803x	.0654
(-7)	.4845	-.1353	.0467	.0174	.0066	-.7978	1.3808	-1.5695x	.0199	.0116
(-6)	.5521	.0462	.0049	-.0106	.2295	-.5836	1.7331x	-.1118	-.0827	-.0097
(-5)	.6102	-.0690	-.0166	-.2030	.7128	-1.6887x	-.1646	-.0610	.0729	-.2094
(-4)	.6782	.1111	.1840	-.9569	1.7787x	-.0444	-.1003	-.0204	.0533	.0072
(-3)	.7482	-.1037	-3.2861	-1.0589x	-.0010	.0023	-.0362	-.0645	8.0121	-.1439
(-2)	.8356	-.1406	1.7603x	-.1808	-.0098	.0094	-.0030	-.0557	-.0984	.0458
(-1)	.9210	-1.9210x	-.1014	-.0312	-.0658	.0242	-.1340	-.0258	-.0456	0.0000
(0)	1.0000x	.1007	.5356	.0011	-.0681	.0008	.1103	.0512	-.0459	0.0000
(1)	.9210	.1060	.0121	.0624	-.0510	.2432	.0043	.0577	0.0000	0.0000
(2)	.8356	-.0878	-.0029	.0776	-.0002	-.0490	-.0647	.0515	0.0000	0.0000
(3)	.7482	.0690	-.0799	.2963	.0478	-8.3194	.0439	0.0000	0.0000	0.0000
(4)	.6782	-.0381	-.1001	-.0145	.0470	-.0307	.4141	0.0000	0.0000	0.0000
(5)	.6102	.1573	.0360	-.0732	.1519	-.0471	0.0000	0.0000	0.0000	0.0000
(6)	.5521	-.0712	-.0829	-.0983	-.3435	.1257	0.0000	0.0000	0.0000	0.0000
(7)	.4845	-.0112	.0289	-.1069	-.0433	0.0000	0.0000	0.0000	0.0000	0.0000
(8)	.4339	.0183	.0897	.0874	-.1062	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	.3897	-.1060	-.2438	-.0381	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	.3482	-.0067	-.2278	.2378	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	.3218	.2315	.8267	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	.2878	.1570	.0399	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	.2585	-.0307	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	.2036	-.0401	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	.1882	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	.1462	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

O-ARRAY

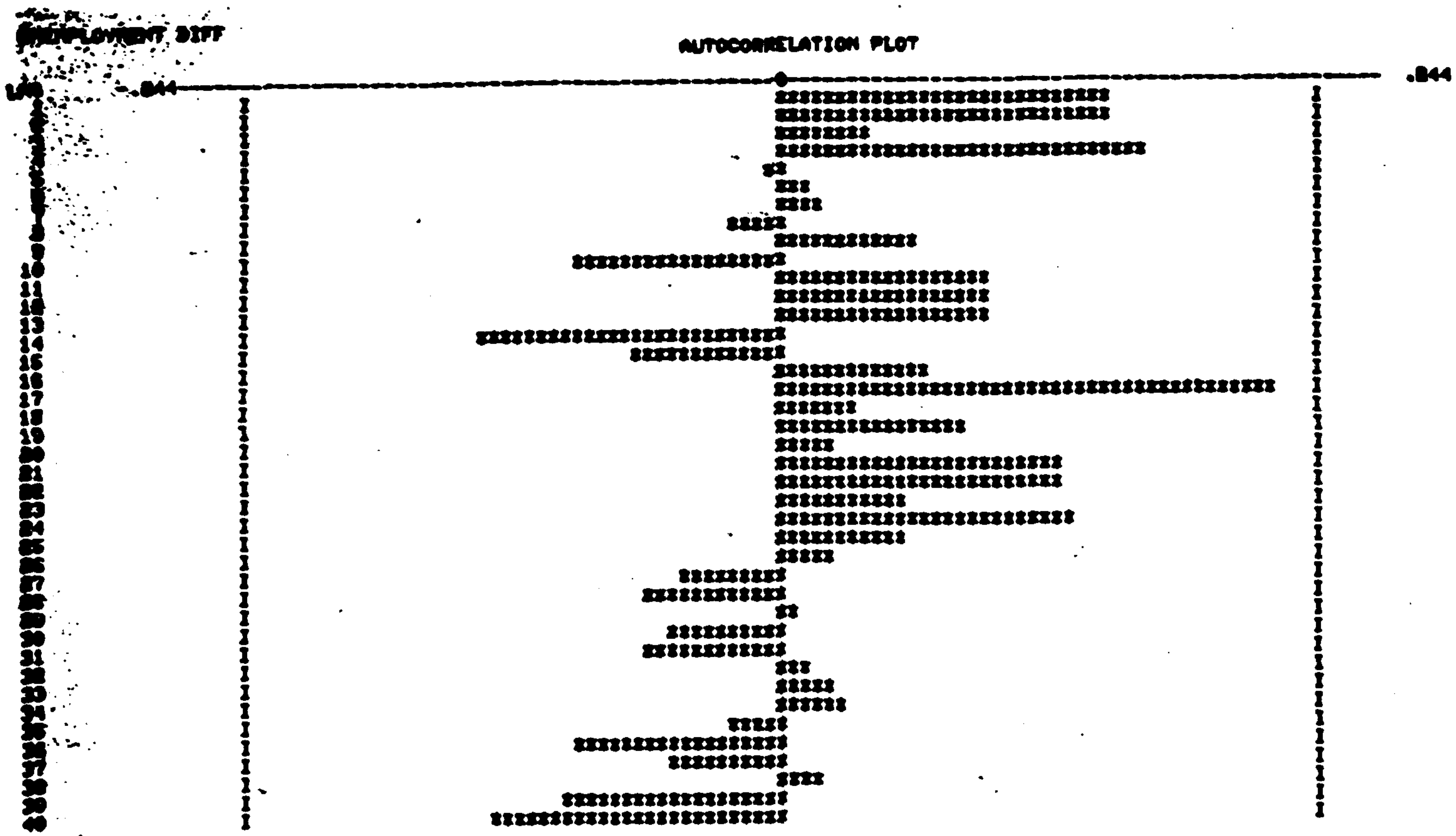
		1	2	3	4	5	6	7	8	9
[illegible]	1.0000	.0000	-.7846	.1078	-.0048	.0002	-.1005	1.0031	.5023	-6.2784
[illegible]	1.0000	.0087	.0381	.1130	-.0087	.3000	-1.5300	.0006	2.7730	-1.2705
[illegible]	1.0000	.1500	-.0845	.1834	.0064	.2040	-.4946	9.7184	-4.5595	-1.3706
[illegible]	1.0000	.0003	1.0024	.1277	-.0220	-.0006	-.4955	-1.0004	.0592	-1.5298
[illegible]	1.0000	.0002	-.1340	-1.3349	-.4259	.0053	.3954	-3.0378	1.4079	1.7619
[illegible]	1.0000	.1158	-.1083	.0083	-1.0083	.0030	.0007	-2.7003	-4.1759	1.5000
[illegible]	1.0000	.1133	.7444	.0316	-.1088	-.0300	10.3529	-2.2470	-.0256	7.2231x
[illegible]	1.0000	.1166	-.3301	.0676	-.0280	-1.0010	-.3090	-2.0050	-1.0257x	-.0063x
[illegible]	1.0000	.1305	-.1406	.0557	-1.0758	3.0428	2.5546	-.0006x	.0073x	-.3700
[illegible]	1.0000	.1063	-.2056	1.1062	34.0606	-0.5167	-3.2660x	-.0041x	.0718	-.3183
[illegible]	1.0000	.1131	-.2053	1.0105	-4.5181	-1.7249x	.0559x	-.1579	.1691	.1169
[illegible]	1.0000	.1016	-.2057	-1.2167	-1.1025x	-.0022x	.4048	-.2540	-.4361	-.3421
[illegible]	1.0000	.1167	.0443	-1.5710x	.0030x	-.1313	-.0346	-.2602	-.0093	-.3433
[illegible]	1.0000	.1082	1.0230x	-.0006x	.1478	1.1015	.2229	-.4310	.3273	-.2453
[illegible]	1.0000	.0857x	.0858x	-.1083	.1836	-.3061	-.7021	-.6100	1.5765	.0029
[illegible]	1.0000x	-.0780x	.0316	-.1068	-11.0300	-.2554	.3346	-.4673	.4012	0.0000
(1)	1.0000x	-.0008	.1911	-.2042	1.0148	.1992	.4064	-7.0071	.0829	0.0000
(2)	1.0000	-.1045	.1647	4.1760	.3477	-.4049	.4435	-.7654	0.0000	0.0000
(3)	1.0000	-.0823	.1578	.1233	.2536	.0096	.4559	-1.6635	0.0000	0.0000
(4)	1.0000	-.1016	.4887	-.2417	-.5002	-.4620	-.1974	0.0000	0.0000	0.0000
(5)	1.0000	-.0853	.1778	-.1440	-.2072	-.3688	1.5395	0.0000	0.0000	0.0000
(6)	1.0000	-.1224	.0000	-.0041	.1131	-.4193	0.0000	0.0000	0.0000	0.0000
(7)	1.0000	-.1044	.2672	1.4538	.4798	.7082	0.0000	0.0000	0.0000	0.0000
(8)	1.0000	-.1017	.2093	-.2630	.2419	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	1.0000	-.1065	.0708	-.1685	1.4853	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	1.0000	-.0759	2.6468	-.1867	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	1.0000	-.0744	.0486	-.2533	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	1.0000	-.1321	.2061	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	1.0000	-.2124	-.0015	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	1.0000	-.1710	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	1.0000	-.1304	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

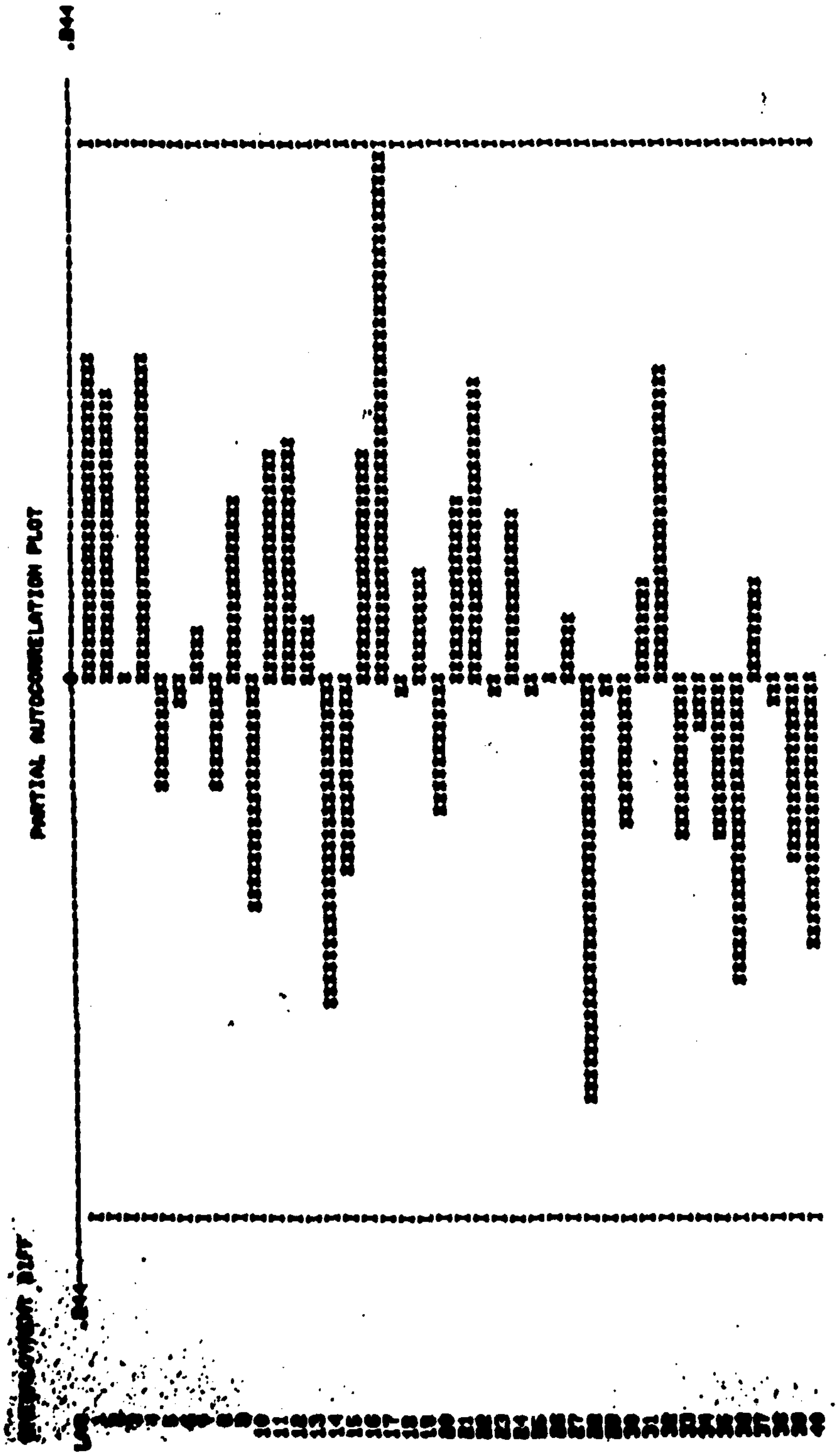
Appendix E-2

TSP Output for Differenced Unemployment Rate Data

I	P0	P	INTNCTY
1	.013	80.000	.400
2	.025	40.000	.020
3	.038	26.667	.124
4	.050	20.000	.400
5	.063	16.000	.228
6	.075	13.333	.087
7	.088	11.429	.312
8	.100	10.000	.017
9	.113	8.889	.170
10	.125	8.000	.178
11	.138	7.273	.012
12	.150	6.667	.061
13	.163	6.154	.176
14	.175	5.714	.286
15	.188	5.333	.004
16	.200	5.000	.015
17	.213	4.706	.013
18	.225	4.444	.077
19	.238	4.211	.321
20	.250	4.000	.078
21	.263	3.810	.193
22	.275	3.636	.107
23	.288	3.478	.075
24	.300	3.333	.037
25	.313	3.200	.201
26	.325	3.077	.078
27	.338	2.963	.000
28	.350	2.857	.180
29	.363	2.759	.072
30	.375	2.667	.000
31	.388	2.581	.026
32	.400	2.500	.011
33	.413	2.424	.126
34	.425	2.353	.127
35	.438	2.286	.047
36	.450	2.222	.148
37	.463	2.162	.314
38	.475	2.105	.073
39	.488	2.051	.218
40	.500	2.000	.012

AVERAGE INTENSITY= .1286000000


PLOYMENT DIFF
AUTOCORRELATION PLOT
-.844
.844


PARTIAL AUTOCORRELATION PLOT

$F(N) = ((-1)**N)*ACF(N)$)

R ←ARRAY

	1	2	3	4	5	6	7	8	9	10
(-15)	.0021	.1185	-.1103	.3188	-.1636	.0363	.2159	.0076	.3840	-1.1913
(-14)	-.1867	-.4032	-.0048	.1133	.0598	-.1730	.8109	-.1906	.5314	-.0573
(-13)	-.0036	.0010	-.0048	.0205	.0257	-.1304	.3312	-1.1488	-.2549	-1.2334
(-12)	.0021	.0841	.0181	-.0101	-.0881	-.1602	.4047	.4580	2.7878	1.3745
(-11)	-.0086	.0821	-.0079	-.0872	.1351	-.3701	2.1701	.2234	1.4997	-4.5092
(-10)	-.0056	-.0363	.0066	4.1086	.2787	-.5044	-1.3013	-1.0390	-14.1314	-5.5838
(-9)	-.0562	.0044	.0057	-.0672	.3081	-1.4528	-.3017	-1.4150	3.6378	-.0789x
(-8)	-.0244	-.0378	.1150	-.5789	.8604	-.3217	.2484	-1.0672	1.0573x	.0067
(-7)	-.0131	-.0103	.0006	-.1502	.0092	-.3300	7.4361	-1.1117x	-.0784	.1611
(-6)	.0105	-2.7052	.1084	-.3019	.3135	-.2700	1.1331x	.0644	-.0337	-.0707
(-5)	.0100	-.1610	-.1557	-1.7390	-.6780	-1.1512x	-.0214	.0381	-.6563	1.1855
(-4)	.1479	-.1033	.7306	-.3612	1.0983x	.0181	.1023	.0371	.1479	.3989
(-3)	-.0321	-.0814	.0112	-.3698x	.0529	.0206	-.0314	-.0609	1.2930	.4661
(-2)	.1327	-.4381	.3711x	-.1285	-.0619	.0586	-.0459	-.1597	-.5536	-.0917
(-1)	-.1310	-.3630x	-.0013	-.1278	-.0015	.0573	-.2940	1.0308	-.2526	0.0000
(0)	1.0000x	-.1022	.1270	-.2813	-.0569	.0972	.9164	-.6432	-.1182	0.0000
(1)	-.1310	-.0608	.0741	-.1598	-.0470	.2257	-.6677	.0978	0.0000	0.0000
(2)	.1327	-.1129	.3255	.0241	-.0378	-.0784	-.4295	.1283	0.0000	0.0000
(3)	-.0321	-.1233	-.0172	-.0413	-.0570	.3446	-.9099	0.0000	0.0000	0.0000
(4)	.1479	-.0106	-.0190	.0286	.0123	.3604	-.3364	0.0000	0.0000	0.0000
(5)	.0100	-.4595	-.0294	1.7900	-.4188	.1797	0.0000	0.0000	0.0000	0.0000
(6)	.0105	.0182	-.0288	-.0242	-.3070	.3692	0.0000	0.0000	0.0000	0.0000
(7)	-.0131	-.0182	-.0308	.2548	-.4729	0.0000	0.0000	0.0000	0.0000	0.0000
(8)	-.0244	.0336	.0915	.4135	-.0829	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	-.0562	.0814	-.4797	.1453	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	-.0056	-4.5429	-.1061	.2549	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	-.0086	.0010	-.1068	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	.0021	.1049	-.0611	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	-.0036	.4027	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	-.1867	-.0593	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	.0021	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	.0600	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

B-ARRAY

	0	1	2	3	4	5	6	7	8	9
(-15)	1.0000	-3.0384	1.5000	-.4500	-.7063	-.4748	4.4814	-8.0084	10.1933	-4.1810
(-14)	1.0000	-.3403	1.8871	1.8331	.3488	-.7859	-1.0883	-3.3583	-8.4380	5.1176
(-13)	1.0000	-1.8824	-173.4001	-.4858	1.3631	4.3000	5.6768	-1.3450	-3.4588	18.3161
(-12)	1.0000	-8.0056	.3504	-.8088	-8.1013	84.8154	-6.0680	8.4788	-1.5348	9.5955
(-11)	1.0000	.0369	.3576	-1.8365	-4.8723	-4.8261	.5660	8.9948	-80.8811	10.3133
(-10)	1.0000	-.3434	.6330	.0081	-4.4128	1.5682	-1.8722	8.4807	-1.7671	84.8735
(-9)	1.0000	-.5650	4.4800	4.3418	13.7066	-.8966	-3.5490	18.8601	-19.3041	-12.0846x
(-8)	1.0000	-.4641	1.3159	1.8065	8.4410	4.5585	-7.8699	-80.4067	18.3047x	-.0622x
(-7)	1.0000	-1.8048	-13.4469	-8.6082	-4.7849	-156.3455	-8.0873	-45.2384x	.0850x	.2248
(-6)	1.0000	-.0500	-12.8628	-.8433	-4.0812	12.1349	83.3708x	-.8541x	-.3943	-.8505
(-5)	1.0000	13.7639	.4366	-6.8159	-3.8372	17.1442x	.8382x	1.3182	-.0460	-.9421
(-4)	1.0000	-1.2169	1.0088	8.5791	-6.5438x	-.8253x	-.1536	1.6280	.7689	-8.4855
(-3)	1.0000	-6.1378	-8.7123	-788.5494x	.0870x	-1.1075	-1.3637	-.8908	-1.0859	-11.1165
(-2)	1.0000	-1.9873	-8.4008x	-.9004x	.5103	-.7390	-.6317	-.6767	7.7838	-1.8591
(-1)	1.0000	-8.6320x	.0881x	-87.5886	.7573	88.8824	-.1852	-1.0442	3.0033	-8.5703
(0)	1.0000x	-1.1310x	1.0111	.6306	.7613	-.1797	.8536	-8.2188	5.0186	0.0000
(1)	1.0000x	-8.0129	-1.5144	-1.7629	1.0324	.1918	1.2836	-4.3644	-1.0490	0.0000
(2)	1.0000	-1.2417	-.5198	-.8972	-.8827	-.8586	18.8185	-3.3647	0.0000	0.0000
(3)	1.0000	-6.8121	.0523	.3618	-1.8822	-8.8639	-3.0079	-2.8904	0.0000	0.0000
(4)	1.0000	-.9323	2.2343	1.1117	1.8613	-65.5785	4.5850	0.0000	0.0000	0.0000
(5)	1.0000	.0527	2.3312	.0303	1.8741	-9.1476	-3.9079	0.0000	0.0000	0.0000
(6)	1.0000	-2.2486	-1.4486	-1.8490	34.8463	-3.7916	0.0000	0.0000	0.0000	0.0000
(7)	1.0000	.0660	-4.8674	-2.8780	-7.0147	-.8310	0.0000	0.0000	0.0000	0.0000
(8)	1.0000	1.2988	.9017	-11.8610	1.0078	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	1.0000	.5231	1.8044	-1.5536	.4324	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	1.0000	-.0356	1.9949	.5787	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	1.0000	-1.9844	-817.0142	-.9065	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	1.0000	-8.0179	1.9464	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	1.0000	.5159	1.6701	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	1.0000	-1.4906	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	1.0000	-.0673	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(F(R) = ACF(R))

R -ARRAY

R	1	2	3	4	5	6	7	8	9	10
(-15)	-.0821	.3891	.0829	-.0708	-8.0059	-.0090	.0800	-.8377	.5898	-.3803
(-14)	-.1267	-.0087	31.0789	-.0691	.0108	-.4104	.0787	.2389	.1761	.2359
(-13)	.0836	-.1081	-8.4074	-.0043	.0180	.0534	.0656	-.1193	-.0853	1.1605
(-12)	.0821	-30.1692	.0031	.0110	-.0101	.0869	.0487	-.0004	-.1794	-.1141
(-11)	.0826	.0160	.0041	-.0112	-.0621	-.0560	.1894	.0524	-.5366	-.0034
(-10)	-.0856	-.0075	.0158	.1465	.1709	-.0383	.0951	.3053	.2861	-.7660
(-9)	.0562	-.0017	.0138	.0319	.0934	-.1191	-.2882	-3.0128	.0076	-1.3078*
(-8)	-.0244	-.0114	.0835	-.0828	.0885	-.2068	-.1637	-.0742	1.3014*	.1380
(-7)	.0131	.0048	.3886	-.1311	-.0062	-.2159	.7304	-1.3683*	.0064	.0221
(-6)	.0105	-.0710	.1305	1.3894	.8113	.6457	1.3430*	.0670	.0075	-.0093
(-5)	-.0100	-.1405	-.6075	13.0721	.3690	-1.3644*	.0854	.0199	-.0124	-.0084
(-4)	.1479	-.1006	-1.4930	-1.2772	1.4334*	.0214	-.0161	.1025	.0529	-.3472
(-3)	.0321	-.1332	-.0149	-1.0857*	-.0690	-.0475	-.0807	.0076	.0832	-.1637
(-2)	.1327	-68.4081	1.2640*	-.1677	-.0337	.0374	.0314	-.0375	.2070	-.0277
(-1)	.1310	-1.1310*	.0017	-.1698	.0010	.0366	-.0215	-.1360	.0837	0.0000
(0)	1.0000*	-.1330	.1697	2.2442	-.0305	.0000	-.0000	-.0668	.2152	0.0000
(1)	.1310	-7.0387	.1515	.0255	.0621	.0171	.0004	-.1176	0.0000	0.0000
(2)	.1327	-.1848	-1.2690	.0210	.0115	-.0119	.0851	-.3123	0.0000	0.0000
(3)	.0321	-.1916	.0144	-.0059	.0352	-.1868	.0816	0.0000	0.0000	0.0000
(4)	.1479	-.0092	.0786	-.0136	.0047	-.1477	.1029	0.0000	0.0000	0.0000
(5)	-.0100	-.0118	.0214	.0638	.1513	.4257	0.0000	0.0000	0.0000	0.0000
(6)	.0105	-.1679	.0149	-.0100	.1433	-.0913	0.0000	0.0000	0.0000	0.0000
(7)	.0131	-.0037	.0228	-.3015	.0862	0.0000	0.0000	0.0000	0.0000	0.0000
(8)	-.0244	-.0132	.0134	-.0064	1.3212	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	.0562	.0190	.0825	-.0085	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	-.0856	-.0023	11.8517	-.0577	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	.0826	-.3469	-38.7732	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	.0821	-11.8105	-.0459	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	.0836	.1010	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	-.1267	-.1736	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	-.0821	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	.0580	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

S-ARRAY

	0	1	2	3	4	5	6	7	8	9
(-15)	1.0000	1.0304	2.0700	-2.0004	.0404	-1.9190	-14.4001	-1.0214	-5.5995	13.0050
(-14)	1.0000	-1.0697	-.0054	-2.0838	1.9120	-.3833	-12.1329	2.7028	-10.4942	-14.8581
(-13)	1.0000	-.0176	1.5536	-2.0387	-2.0978	10.7355	-28.0514	12.0555	9.2515	21.0453
(-12)	1.0000	.0056	2.0300	.7874	-5.0169	-46.7848	-60.3060	-18.7483	23.8429	-115.1000
(-11)	1.0000	-2.0369	2.4355	2.0072	-11.0835	30.6937	-6.4940	-12.7896	-57.7000	-130.5757
(-10)	1.0000	-1.0566	1.1009	.7877	-7.1446	80.5744	85.0289	-19.0074	93.3055	178.8312
(-9)	1.0000	-1.4350	-6.6843	9.1348	-46.3086	12.1404	5.1825	-4.0507	86.9597	9.0937x
(-8)	1.0000	-1.5359	1.8130	12.0279	5.8145	7.1065	11.0376	-115.7865	14.8718x	-.6720x
(-7)	1.0000	-.1962	3.4090	9.9641	-6.9763	843.0255	80.9915	36.7543x	.7278x	-1.6303
(-6)	1.0000	-1.0606	-15.4569	.5978	-4.9453	-5.0000	45.0304x	-.0030x	1.7760	-6.4020
(-5)	1.0000	-15.7639	-.1116	-.7782	-7.0511	-14.4050x	.7072x	-2.5267	2.4435	-11.3402
(-4)	1.0000	-.7831	-.5341	6.4567	-6.0141x	-.0063x	1.5440	.5857	2.1488	9.7613
(-3)	1.0000	3.1378	-6.5218	558.9999x	.6643x	-.4001	2.0686	-2.3217	17.0468	-30.9716
(-2)	1.0000	-.0127	-6.5233x	-.7658x	.9377	-1.1571	.9226	-2.8852	-80.8203	-6.4772
(-1)	1.0000	6.6320x	.7068x	73.3008	1.1836	-44.2153	1.7143	-7.9171	10.8753	-4.3306
(0)	1.0000x	-.8690x	.7568	-.0790	1.1241	-2.1909	-2.9055	-21.3722	-2.7569	0.0000
(1)	1.0000x	.0188	.7407	-1.2496	.9319	-2.5263	10.6593	-3.0217	2.2874	0.0000
(2)	1.0000	-.7583	.1332	-1.0278	3.2403	-6.2991	-61.6157	1.3819	0.0000	0.0000
(3)	1.0000	3.0111	1.0162	-2.5290	-3.0474	-4.1768	-33.5338	-3.9053	0.0000	0.0000
(4)	1.0000	-1.0677	-.5666	-2.3388	4.8286	160.0773	-14.9971	0.0000	0.0000	0.0000
(5)	1.0000	-2.0527	3.2119	-.8489	5.1880	3.8621	-18.6212	0.0000	0.0000	0.0000
(6)	1.0000	.2486	2.0030	-4.4855	-73.3415	15.3325	0.0000	0.0000	0.0000	0.0000
(7)	1.0000	-2.2660	-8.5111	-2.5148	-38.4751	-.0061	0.0000	0.0000	0.0000	0.0000
(8)	1.0000	-3.2968	6.1420	53.9185	-.0633	0.0000	0.0000	0.0000	0.0000	0.0000
(9)	1.0000	-2.5231	10.4958	-2.5497	.8811	0.0000	0.0000	0.0000	0.0000	0.0000
(10)	1.0000	-1.9644	-.0179	-2.5306	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(11)	1.0000	-.0066	.5924	-2.5344	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(12)	1.0000	.0179	2.5374	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(13)	1.0000	-2.5159	1.3849	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(14)	1.0000	-.5094	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(15)	1.0000	-1.9367	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(16)	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Appendix E-3

BMDP Output for Optimal Unemployment Rate Model and a Comparison of Cumulative Periodogram Plots

```
  ARIMA          VARIABLE IS UNEMP.
                 ARORDERS ARE '(1,2)'.
                 ARVALUES = 1.130, -.1477.
                 CENTERED./

  ESTIMATION   RESIDUALS = RR./

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN EACH ESTIMATE LESS THAN  .1000E-03

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- UNEMP
 INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES

UNEMP      RANDOM   REMOVED  1-  81

PARAMETER VARIABLE   TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.  T-RATIO
     1  UNEMP         AR      1      1     1.1301     .1127     10.03
     2  UNEMP         AR      1      2     -.1477     .1154     -1.28

RESIDUAL SUM OF SQUARES  =          5.065058
DEGREES OF FREEDOM       =                77
RESIDUAL MEAN SQUARE     =           .065782

ESTIMATION BY BACKCASTING METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN  .1000E-04


SUMMARY OF THE MODEL

OUTPUT VARIABLE -- UNEMP
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES

UNEMP      RANDOM   REMOVED  1-  81

PARAMETER VARIABLE   TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.  T-RATIO
     1  UNEMP         AR      1      1     1.1322     .0011   1071.73
     2  UNEMP         AR      1      2     -.1383     .0047    -29.10

RESIDUAL SUM OF SQUARES  =          5.079037 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                77
RESIDUAL MEAN SQUARE     =           .065962
1PAGE   8
```

```
ARIMA       VARIABLE IS UNEMP.
             ARORDERS ARE '(1,2)'.
             ARVALUES = 1.130, -.1477.
             CENTERED./
```

THE COMPONENT HAS BEEN ADDED TO THE MODEL

```
  THE CURRENT MODEL HAS
OUTPUT VARIABLE = UNEMP
INPUT  VARIABLE = NOISE
```

```
  ESTIMATION   RESIDUALS = RI.
               METHOD IS CLS./
```

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN EACH ESTIMATE LESS THAN .1000E-03

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- UNEMP
INPUT VARIABLES -- NOISE

VARIABLE	VAR. TYPE	MEAN	TIME	DIFFERENCES
UNEMP	RANDOM	REMOVED	1- 81	

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	UNEMP	AR	1	1	1.1301	.1127	10.03
2	UNEMP	AR	1	2	-.1477	.1154	-1.28

```
 RESIDUAL SUM OF SQUARES  =      5.065950
DEGREES OF FREEDOM        =          77
RESIDUAL MEAN SQUARE      =       .065792
```

```
ACF          VARIABLE IS RI.  MAXLAG IS 20./

NUMBER OF OBSERVATIONS              =           79
MEAN OF THE (DIFFERENCED) SERIES =           .0101
STANDARD ERROR OF THE MEAN          =           .0286
T-VALUE OF MEAN (AGAINST ZERO)      =           .3527

AUTOCORRELATIONS

  1- 12    -.02  .12  0.0  .16 -.02  .02  .03 -.02  .08 -.11  .09  .06
 ST.E.      .11  .11  .11  .11  .12  .12  .12  .12  .12  .12  .12  .12

 13- 20     .09 -.14 -.05  .04  .19 -.01  .08 -.01
 ST.E.      .12  .12  .12  .12  .12  .13  .13  .13

PLOT OF SERIAL CORRELATION

              -1.0  -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
 LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                         I
   1   -.024                     +     XI    +
   2    .120                     +       IXXX +
   3    .003                     +       I    +
   4    .161                     +       IXXXX +
   5   -.023                     +     XI    +
   6    .021                     +       IX   +
   7    .030                     +       IX   +
   8   -.023                     +     XI    +
   9    .079                     +       IXX  +
  10   -.111                     +  XXXI     +
  11    .086                     +       IXX  +
  12    .061                     +       IXX  +
  13    .091                     +       IXX  +
  14   -.141                     + XXXXI     +
  15   -.046                     +     XI    +
  16    .036                     +       IX   +
  17    .189                     +       IXXXXX+
  18   -.010                     +       I    +
  19    .077                     +       IXX  +
  20   -.009                     +       I    +
```

```
PACF         VARIABLE IS RX.  MAXLAG IS 20./


NUMBER OF OBSERVATIONS              =          79
MEAN OF THE (DIFFERENCED) SERIES    =       .0101
STANDARD ERROR OF THE MEAN          =       .0286
T-VALUE OF MEAN (AGAINST ZERO)      =       .3527


PARTIAL AUTOCORRELATIONS

  1- 12    -.02  .12  .01  .15 -.02 -.01  .03 -.05  .08 -.11  .06  .10
 ST.E.      .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11

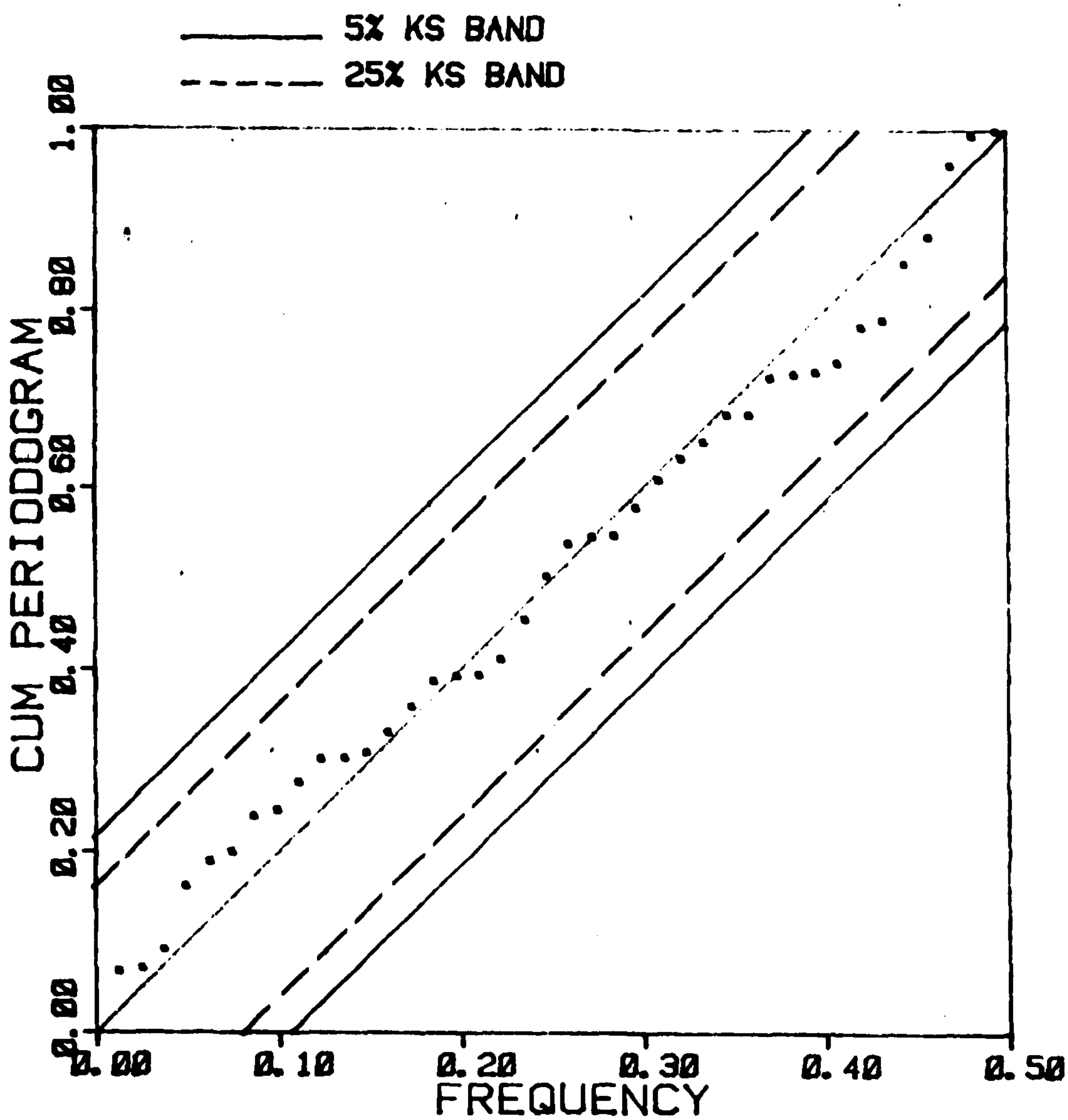
 13- 20     .06 -.13 -.10  .04  .22  .02  .06 -.06
 ST.E.      .11  .11  .11  .11  .11  .11  .11  .11


PLOT OF SERIAL CORRELATION

            -1.0 -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1  -.024                     +    II     +
  2   .119                     +     IIII  +
  3   .009                     +     I     +
  4   .149                     +     IIIII +
  5  -.018                     +     I     +
  6  -.014                     +     I     +
  7   .033                     +     II    +
  8  -.048                     +    II     +
  9   .080                     +     III   +
 10  -.108                     +  IIII     +
 11   .062                     +     III   +
 12   .101                     +     IIII  +
 13   .056                     +     II    +
 14  -.126                     +  IIII     +
 15  -.103                     +  IIII     +
 16   .042                     +     II    +
 17   .223                     +     IIIIIII
 18   .021                     +     II    +
 19   .060                     +     III   +
 20  -.064                     +   III     +
```

UNEMP RATE

ARIMA (2, 0, 0)



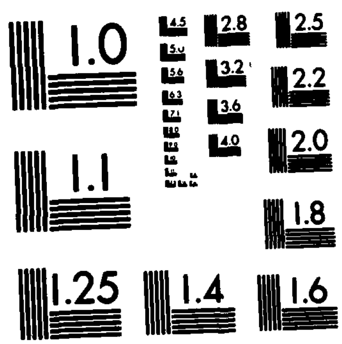
AD-A124 845 FACTORS INFLUENCING ARMY ACCESSIONS(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF ENGINEERING K M KALINICH ET AL. DEC 82 AFIT/GOR/OS/82D-7 4/4

UNCLASSIFIED F/G 12/1 NL

END

FILMED

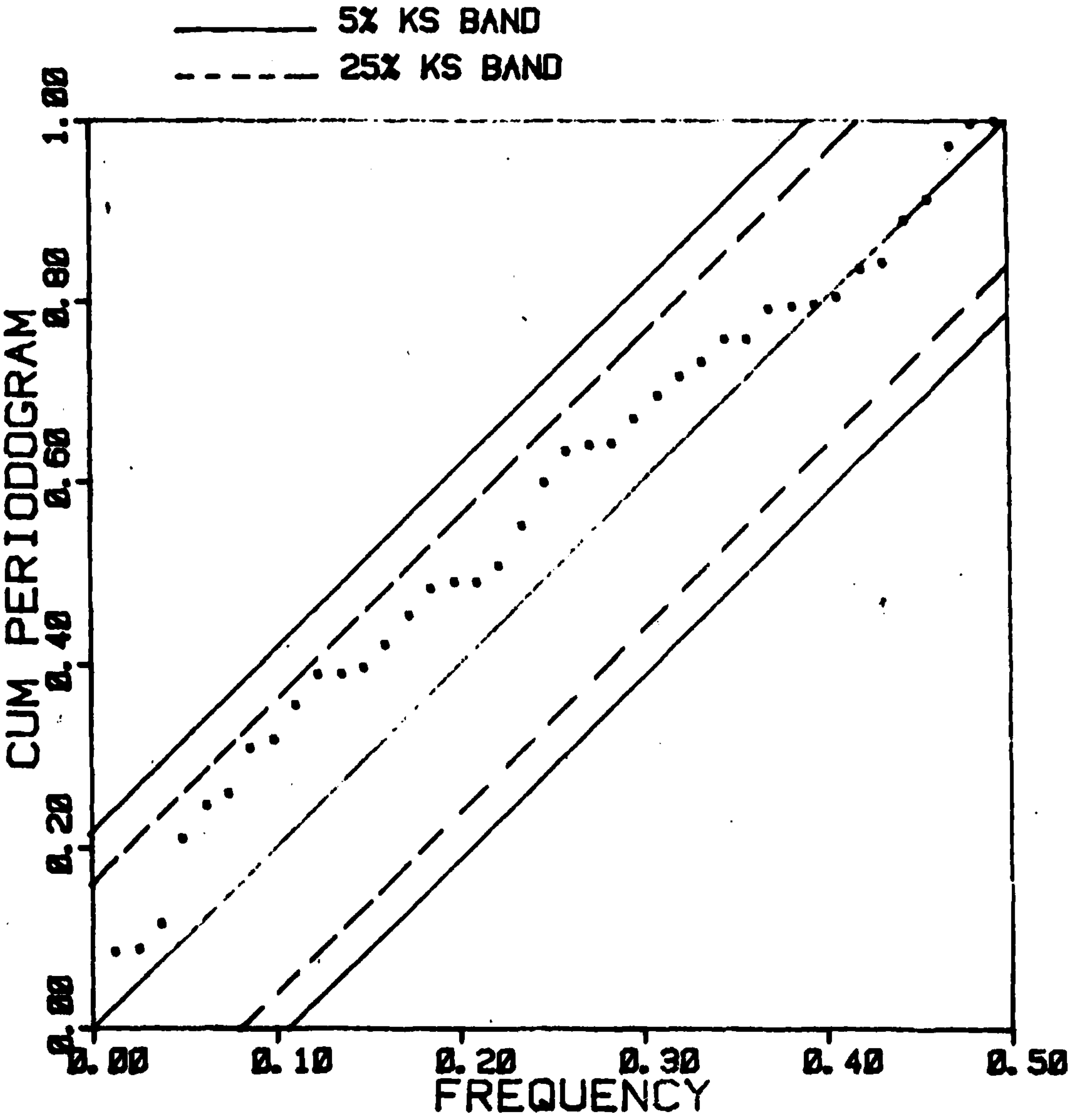
DTIC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

UNEMP RATE

ARIMA(1, 1, 0)



Appendix E-4

BMDP Output for Leading Indicator Transfer Function Model with Unemployment Rates as Input Variable

```
ARIMA       VARIABLE IS ACC13AN.
             ARORDERS ARE '(1,6)'.
             ARVALUES = .5288, .4685.
             CENTERED./
THE COMPONENT HAS BEEN ADDED TO THE MODEL

  THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AN
INPUT  VARIABLE = NOISE

   INDEP       VARIABLE IS UNEMP.
             UPORDERS = '(1,7,8)'.
             UPVALUES = 703.0, -441.0, 379.0./
THE COMPONENT HAS BEEN ADDED TO THE MODEL

  THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AN
INPUT  VARIABLE = NOISE   UNEMP

   ESTIMATION   RESIDUALS IS RYI.
             METHOD IS CLS./

  ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

  RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN  .1000E-04

  SUMMARY OF THE MODEL

  OUTPUT VARIABLE -- ACC13AN
 INPUT VARIABLES -- NOISE   UNEMP

  VARIABLE  VAR. TYPE  MEAN     TIME    DIFFERENCES

  ACC13AN   RANDOM   REMOVED  1-  81

  UNEMP     RANDOM            1-  81


 PARAMETER VARIABLE   TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.  T-RATIO
       1  ACC13AN    AR     1      1       .5288       .0887      5.96
       2  ACC13AN    AR     1      6       .4685       .0877      5.25
       3  UNEMP      UP     1      1    702.9327    143.9109      4.88
       4  UNEMP      UP     1      7   -441.6028    231.3832     -1.91
       5  UNEMP      UP     1      8    378.8578    231.3298      1.64

  RESIDUAL SUM OF SQUARES  =  16601553.815996
 DEGREES OF FREEDOM      =              62
 RESIDUAL MEAN SQUARE    =  267766.984129
```

ACF VARIABLE IS RTI. MAXLAG IS 20./

NUMBER OF OBSERVATIONS	=	67
MEAN OF THE (DIFFERENCED) SERIES	=	-8.6231
STANDARD ERROR OF THE MEAN	=	61.2632
T-VALUE OF MEAN (AGAINST ZERO)	=	-.1400

AUTOCORRELATIONS

1- 12	-.17	.06	.11	-.01	.10	-.13	-.05	.07	-.02	-.03	.11	-.09
ST.E.	.12	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13	.13

13- 20	.03	-.11	.07	-.12	-.09	.01	-.09	-.04
ST.E.	.13	.13	.14	.14	.14	.14	.14	.14

PLOT OF SERIAL CORRELATION

```
               -1.0 -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR.    +----+----+----+----+----+----+----+----+----+----+
                                         I
  1   -.171                     + IIIII      +
  2    .057                     +      II    +
  3    .107                     +      IIII  +
  4   -.009                     +      I     +
  5    .098                     +      III   +
  6   -.130                     +  IIII      +
  7   -.052                     +    II      +
  8    .071                     +      III   +
  9   -.021                     +    II      +
 10   -.030                     +    II      +
 11    .109                     +      IIII  +
 12   -.091                    +   III        +
 13    .034                    +       II     +
 14   -.110                    +  IIII        +
 15    .073                    +       III    +
 16   -.116                    +  IIII        +
 17   -.088                    +    III       +
 18    .010                    +       I      +
 19   -.090                    +    III       +
 20   -.040                    +     II       +
```

```
PACF          VARIABLE IS R11.  MAXLAG IS 20./

NUMBER OF OBSERVATIONS             =          67
MEAN OF THE (DIFFERENCED) SERIES   =     -8.6231
STANDARD ERROR OF THE MEAN         =     61.2632
T-VALUE OF MEAN (AGAINST ZERO)     =      -.1408


PARTIAL AUTOCORRELATIONS

  1- 12    -.17  .03  .12  .03  .09 -.12 -.11  .04  .04 -.02  .12 -.06
 ST.E.      .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .12

 13- 20    -.03 -.13  .07 -.11 -.07 -.02 -.07 -.09
 ST.E.      .12  .12  .12  .12  .12  .12  .12  .12


PLOT OF SERIAL CORRELATION

           -1.0 -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG  CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1  -.171                      + XXXXI    +
  2   .029                      +    IX    +
  3   .125                      +    IXXX  +
  4   .029                      +    IX    +
  5   .093                      +    IXX   +
  6  -.119                      +  XXXI    +
  7  -.114                      +  XXXI    +
  8   .037                      +    IX    +
  9   .037                      +    IX    +
 10  -.017                      +    I     +
 11   .120                      +    IXXX  +
 12  -.065                      +   XXI    +
 13  -.034                      +    XI    +
 14  -.130                      +  XXXI    +
 15   .068                      +    IXX   +
 16  -.113                      +  XXXI    +
 17  -.069                      +   XXI    +
 18  -.016                      +    I     +
 19  -.069                      +   XXI    +
 20  -.087                      +   XXI    +
```

Appendix E-5

Forecasts Using Optimal Unemployment Rate Transfer Function Model

```
ARIMA       VARIABLE IS UNEMP.
            ARORDERS ARE '(1,2)'.
            ARVALUES = 1.130, -.1477.
            CENTERED./

 THE COMPONENT HAS BEEN ADDED TO THE MODEL

 THE CURRENT MODEL HAS
OUTPUT VARIABLE = UNEMP
INPUT  VARIABLE = NOISE


 FORECAST     CASES ARE 24.  JOIN./


FORECAST ON VARIABLE UNEMP    FROM TIME PERIOD    82
```

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	9.45750	.25650	
83	9.40947	.38704	
84	9.36140	.48342	
85	9.31434	.56091	
86	9.26816	.62633	
87	9.22294	.68320	
88	9.17867	.73359	
89	9.13531	.77885	
90	9.09286	.81991	
91	9.05130	.85742	
92	9.01060	.89191	
93	8.97075	.92376	
94	8.93173	.95331	
95	8.89352	.98079	
96	8.85611	1.00644	
97	8.81948	1.03044	
98	8.78361	1.05293	
99	8.74849	1.07405	
100	8.71411	1.09391	
101	8.68043	1.11262	
102	8.64747	1.13027	
103	8.61518	1.14694	
104	8.58358	1.16270	
105	8.55263	1.17760	

```
 STANDARD ERROR =  .256499     (BY CONDITIONAL METHOD  )


 PSIWEIGHT    MAXPSI = 40./

   40 PSI-WEIGHTS ARE STORED
```

```
ERASE       MODEL./

UNIVARIATE TIME SERIES MODEL ERASED

ARIMA       VARIABLE IS ACC13AM.
            ARORDERS ARE '(1,6)'.
            ARVALUES = .5280, .4605.
            CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

  THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE

INDEP       VARIABLE IS UNEMP.
            UPORDERS = '(1,7,8)'.
            UPVALUES = 703.0, -441.0, 379.0.
            CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

  THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE    UNEMP

FORECAST    CASES = 40./
```

FORECAST CASES = 40./

FORECAST ON VARIABLE ACC13AM FROM TIME PERIOD 82

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	4777.45065	519.05066	
83	5044.97587	626.29125	
84	4960.74300	680.43900	
85	4802.42211	735.11545	
86	4494.18736	774.89383	
87	4731.33075	810.54486	
88	4725.19640	879.44646	
89	4695.09901	921.17142	
90	4754.05254	961.44790	
91	4690.90499	991.60603	
92	4577.10203	1014.83174	
93	4575.26554	1034.27679	
94	4556.00062	1061.18032	
95	4527.49499	1094.63149	
96	4539.52046	1126.66180	
97	4521.05505	1152.07122	
98	4457.03396	1173.10657	
99	4424.57060	1189.19910	
100	4399.92049	1206.44789	
101	4374.74340	1226.82761	
102	4360.31626	1240.00142	
103	4350.10739	1269.77766	
104	4324.52374	1287.65633	
105	4292.71600	1302.16350	
106	4265.79307	1315.79005	

BASED ON THE AVAILABLE DATA, ONLY 25 FORECASTS CAN BE MADE

STANDARD ERROR = 519.051 (BY CONDITIONAL METHOD)

Appendix E-6

Enhanced Transfer Function and Forecasts

```
ARIMA        VARIABLE IS ACC13AM.
              ARORDERS ARE '(1,6)'.
              ARVALUES = .5200, .4605.
              MAORDERS ARE '(1)'.
              CENTERED./

 THE COMPONENT HAS BEEN ADDED TO THE MODEL

 THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE


 INDEP        VARIABLE IS UNEMP.
              UPORDERS = '(1,7,8)'.
              UPVALUES = 570.0, -518.0, 436.0./

 THE COMPONENT HAS BEEN ADDED TO THE MODEL

 THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE    UNEMP

   ESTIMATION   RESIDUALS IS RTX.
              METHOD IS CLS./


ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

  RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN  .1000E-04

  SUMMARY OF THE MODEL

  OUTPUT VARIABLE -- ACC13AM
 INPUT VARIABLES -- NOISE    UNEMP

  VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES

  ACC13AM    RANDOM    REMOVED  1-  81

  UNEMP      RANDOM             1-  81


PARAMETER VARIABLE   TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1  ACC13AM     MA      1      1       .3169       .1663     1.91
      2  ACC13AM     AR      1      1       .6832       .1029     6.64
      3  ACC13AM     AR      1      6       .3114       .1013     3.07
      4  UNEMP       UP      1      1    701.9190    133.3072     5.26
      5  UNEMP       UP      1      7   -493.0116    241.7300    -2.04
      6  UNEMP       UP      1      8    462.9891    240.2444     1.93

  RESIDUAL SUM OF SQUARES  =  15693750.567909
 DEGREES OF FREEDOM        =               61
 RESIDUAL MEAN SQUARE      =   257274.730621
```

```
ACF        VARIABLE IS RYX.  MAXLAG IS 20./

NUMBER OF OBSERVATIONS             =          67
MEAN OF THE (DIFFERENCED) SERIES   =      4.8272
STANDARD ERROR OF THE MEAN         =     59.5707
T-VALUE OF MEAN (AGAINST ZERO)     =       .0810


AUTOCORRELATIONS

  1- 12   -.02  .03  .09 -.01  .08 -.01 -.05  .04 -.02 -.06  .07 -.04
 ST.E.     .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .13

 13- 20    .03 -.11  .01 -.16 -.10 -.01 -.08 -.06
 ST.E.     .13  .13  .13  .13  .13  .13  .13  .13


PLOT OF SERIAL CORRELATION

         -1.0 -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG  CORR. +----+----+----+----+----+----+----+----+----+----+
                                    I
  1   -.018                    +     I     +
  2    .036                    +     IX    +
  3    .097                    +     IXX   +
  4   -.006                    +     I     +
  5    .077                    +     IXX   +
  6   -.011                    +     I     +
  7   -.046                    +    XI     +
  8    .036                    +     IX    +
  9   -.019                    +     I     +
 10   -.062                    +   XXI     +
 11    .073                    +     IXX   +
 12   -.044                    +    XI     +
 13    .032                    +     IX    +
 14   -.105                    +  XXXI     +
 15    .009                    +     I     +
 16   -.156                    + XXXXI     +
 17   -.097                    +   XXI     +
 18   -.013                    +     I     +
 19   -.079                    +   XXI     +
 20   -.063                    +   XXI     +
```

```
PACF        VARIABLE IS RTX.  MAXLAG IS 20./

NUMBER OF OBSERVATIONS             =          67
MEAN OF THE (DIFFERENCED) SERIES   =      4.0272
STANDARD ERROR OF THE MEAN         =     59.5707
T-VALUE OF MEAN (AGAINST ZERO)     =       .0810

PARTIAL AUTOCORRELATIONS

  1- 12    -.02  .03  .09  0.0  .07 -.02 -.05  .02 -.01 -.06  .07 -.03
 ST.E.      .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .12

 13- 20     .03 -.12  .02 -.18 -.08 -.01 -.04 -.06
 ST.E.      .12  .12  .12  .12  .12  .12  .12  .12

PLOT OF SERIAL CORRELATION

           -1.0 -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG  CORR. +----+----+----+----+----+----+----+----+----+----+
                                     I
  1  -.018                      +    I    +
  2   .029                      +    IX   +
  3   .080                      +    IXX  +
  4  -.004                      +    I    +
  5   .072                      +    IXX  +
  6  -.016                      +    I    +
  7  -.050                      +   XI    +
  8   .022                      +    IX   +
  9  -.012                      +    I    +
 10  -.063                      +  XXI    +
 11   .070                      +    IXX  +
 12  -.029                      +   XI    +
 13   .032                      +    IX   +
 14  -.116                      + XXXI    +
 15   .024                      +    IX   +
 16  -.170                      +XXXXI    +
 17  -.082                      +  XXI    +
 18  -.011                      +    I    +
 19  -.042                      +   XI    +
 20  -.058                      +   XI    +
```

```
ARIMA        VARIABLE IS UNEMP.
              ARORDERS ARE '(1,2)'.
              ARVALUES = 1.130, -.1477.
              CENTERED./


THE COMPONENT HAS BEEN ADDED TO THE MODEL

  THE CURRENT MODEL HAS
OUTPUT VARIABLE = UNEMP
INPUT  VARIABLE = NOISE


 FORECAST     CASES ARE 24.  JOIN./


FORECAST ON VARIABLE UNEMP    FROM TIME PERIOD    82
```

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	9.45750	.25650	
83	9.40947	.38704	
84	9.36140	.48342	
85	9.31434	.56091	
86	9.26816	.62633	
87	9.22294	.68320	
88	9.17867	.73359	
89	9.13531	.77885	
90	9.09286	.81991	
91	9.05130	.85742	
92	9.01060	.89191	
93	8.97075	.92376	
94	8.93173	.95331	
95	8.89352	.98079	
96	8.85611	1.00644	
97	8.81940	1.03044	
98	8.78361	1.05293	
99	8.74849	1.07405	
100	8.71411	1.09391	
101	8.68043	1.11262	
102	8.64747	1.13027	
103	8.61518	1.14694	
104	8.58358	1.16270	
105	8.55263	1.17760	

```
STANDARD ERROR =  .256499     (BY CONDITIONAL METHOD  )
```

```
PSIWEIGHT    MAXPSI = 40./

40 PSI-WEIGHTS ARE STORED

ERASE        MODEL./

UNIVARIATE TIME SERIES MODEL ERASED

ARIMA        VARIABLE IS ACC13AM.
             ARORDERS ARE '(1,6)'.
             ARVALUES = .5280, .4605.
             MAORDERS ARE '(1)'.
             CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

  THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE

INDEP        VARIABLE IS UNEMP.
             UPORDERS = '(1,7,8)'.
             UPVALUES = 570.0, -518.0, 436.0.
             CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

  THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE    UNEMP
```

FORECAST ON VARIABLE ACC13AM FROM TIME PERIOD   82

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	4611.78357	523.60969	
83	4911.71012	596.48925	
84	4821.86786	640.12685	
85	4695.49640	673.43469	
86	4419.16461	702.15502	
87	4707.62620	720.13057	
88	4662.67102	792.60933	
89	4603.57373	827.27691	
90	4650.69096	857.03060	
91	4619.14989	878.45810	
92	4529.14543	894.37006	
93	4560.90222	907.41959	
94	4539.84647	929.35123	
95	4494.23172	957.45016	
96	4495.38239	983.60741	
97	4478.73134	1004.14021	
98	4429.56796	1019.35602	
99	4419.28446	1030.85910	
100	4405.22137	1044.27938	
101	4377.82044	1061.11509	
102	4364.90037	1079.54503	
103	4351.40223	1096.73293	
104	4322.60974	1111.01581	
105	4303.61324	1122.19305	
106	4280.03627	1132.90060	

BASED ON THE AVAILABLE DATA, ONLY   25 FORECASTS CAN BE MADE

STANDARD ERROR = 523.610   (BY CONDITIONAL METHOD)

1PAGE 10   ACC13AM WITH UNEMP

Appendix E-7

BMDP Output for Leading Indicator Transfer Function Models (with Forecasts) with Producer Price Index as Input Variable

```
ARIMA          VARIABLE IS PPI.
               DFORDER IS 1.
               ARORDERS ARE '(3,12)'.
               ARVALUES = .2724, .3807.
               MAORDERS ARE '(1), (6)'.
               MAVALUES = -.8461, -.2382.
               CENTERED./
ESTIMATION     RESIDUALS = RX.
               METHOD IS CLS./


ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN  .1000E-04


SUMMARY OF THE MODEL

OUTPUT VARIABLE -- PPI
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN       TIME      DIFFERENCES
                                                 1
PPI         RANDOM    REMOVED  1-  81   (1-B  )

PARAMETER VARIABLE   TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.  T-RATIO
     1    PPI         MA      1       1    -.8800      .0664    -13.24
     2    PPI         MA      2       6    -.3167      .1308     -2.42
     3    PPI         AR      1       3     .2882      .1152      2.50
     4    PPI         AR      1      12     .4860      .1066      4.54

RESIDUAL SUM OF SQUARES   =        54.451634
DEGREES OF FREEDOM        =               64
RESIDUAL MEAN SQUARE      =          .850807


 FILTER       VARIABLE IS ACC13AM.
              RESIDUALS = RY./


RESIDUAL MEAN SQUARE      =  4068178.011306

VARIABLE ACC13AM  IS FILTERED. RESULTS ARE STORED IN VARIABLE RY
```

```
.ACF          VARIABLE IS RY.  MAXLAG IS 24./

NUMBER OF OBSERVATIONS                 =           81
MEAN OF THE (DIFFERENCED) SERIES       =      -3.2827
STANDARD ERROR OF THE MEAN             =     283.8347
T-VALUE OF MEAN (AGAINST ZERO)         =       -.0167

AUTOCORRELATIONS

  1- 12     -.80  .78 -.72  .64 -.55  .45 -.35  .26 -.18  .13 -.06  .03
 ST.E.       .11  .18  .22  .25  .27  .28  .29  .29  .30  .30  .30  .30

 13- 24     -.07  .11 -.10  .10 -.10  .11 -.11  .10 -.09  .07 -.04  .01
 ST.E.       .30  .30  .30  .30  .30  .30  .30  .30  .30  .30  .30  .30

PLOT OF SERIAL CORRELATION

                -1.0 -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR.   +----+----+----+----+----+----+----+----+----+----+
                                        I
  1   -.803   XXXXXXXXXXXXXXXXXX+XXXXI    +
  2    .785                +        IXXXXXXXXX+XXXXXXXXXX
  3   -.720        XXXXXXX+XXXXXXXXXXI              +
  4    .640                +          IXXXXXXXXXXX+XXXX
  5   -.554             X+XXXXXXXXXXXI                +
  6    .454             +             IXXXXXXXXXXX    +
  7   -.353             +     XXXXXXXXXI               +
  8    .261             +             IXXXXXXX        +
  9   -.182            +         XXXXXI                 +
 10    .126            +              IXXX              +
 11   -.063            +            XXI                 +
 12    .026            +              IX                +
 13   -.072            +            XXI                 +
 14    .100            +              IXXX              +
 15   -.101            +           XXXI                 +
 16    .080            +              IXX               +
 17   -.103            +           XXXI                 +
 18    .112            +              IXXX              +
 19   -.100            +           XXXI                 +
 20    .100            +              IXXX              +
 21   -.082            +            XXI                 +
 22    .080            +              IXX               +
 23   -.030            +             XI                 +
 24    .006            +              I                 +


PACF
```

```
PACF          VARIABLE IS RV.  MAXLAG IS 24./

NUMBER OF OBSERVATIONS              =          81
MEAN OF THE (DIFFERENCED) SERIES    =     -3.2827
STANDARD ERROR OF THE MEAN          =    205.0347
T-VALUE OF MEAN (AGAINST ZERO)      =      -.0157

PARTIAL AUTOCORRELATIONS

  1- 12     -.88 -.16 -.24 -.21 -.04 -.23 -.02 -.13 -.08  .02  .07  .18
  ST.E.      .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11

 13- 24     -.38 -.12  .03 -.12  .05 -.08  .06  .01 -.06 -.01  .04  .05
  ST.E.      .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11

PLOT OF SERIAL CORRELATION

              -1.0  -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR.   +----+----+----+----+----+----+----+----+----+----+
                                         I
  1   -.883     XXXXXXXXXXXXXXXXXX+XXXXI    +
  2   -.183                      +XXXXI    +
  3   -.248                     X+XXXXI    +
  4   -.287                      XXXXXI    +
  5   -.044                      +    XI    +
  6   -.228                     X+XXXXI    +
  7   -.017                      +     I    +
  8   -.138                      +  XXXI    +
  9   -.076                      +   XXI    +
 10    .015                      +     I    +
 11    .072                      +     IXX  +
 12    .178                      +     IXXXX+
 13   -.387                 XXXX+XXXXI    +
 14   -.128                      +  XXXI    +
 15    .033                      +     IX   +
 16   -.125                      +  XXXI    +
 17    .028                      +     IX   +
 18   -.085                      +   XXI    +
 19    .081                      +     IXX  +
 20    .005                      +     I    +
 21   -.068                      +   XXI    +
 22   -.013                      +     I    +
 23    .042                      +     IX   +
 24    .048                      +     IX   +
```

CCF VARIABLES ARE RX,RY. MAXLAG IS 24./

PLOT OF SERIAL CORRELATIO

EFFECTIVE NUMBER OF OBSERVATIONS = 80

CORRELATION OF RX AND RY IS .24

CROSS CORRELATIONS OF RX (I) AND RY (I+K)

1- 12	-.22	.17	-.14	.16	-.10	.00	-.00	.06	-.06	.01	.05	-.01
ST.E.	.12	.12	.12	.13	.13	.13	.13	.13	.13	.13	.13	.13
13- 24	0.0	.01	-.02	0.0	.02	-.01	-.01	0.0	-.01	.03	-.04	.04
ST.E.	.13	.14	.14	.14	.14	.14	.14	.14	.15	.15	.15	.15

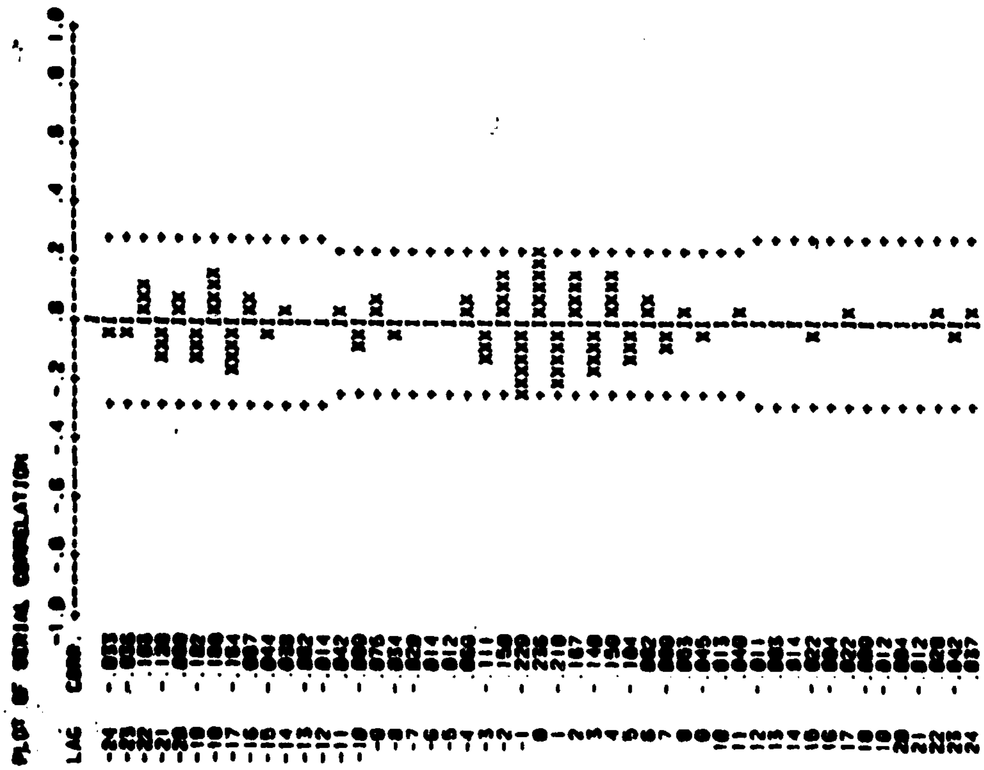
CROSS CORRELATIONS OF RY (I) AND RX (I+K)

1- 12	-.23	.15	-.11	.07	.01	.01	-.02	-.03	.00	-.00	.04	-.01
ST E.	.12	.12	.12	.13	.13	.13	.13	.13	.13	.13	.13	.13
13- 24	0.0	.04	-.04	.00	-.16	.17	-.10	.10	-.13	.10	-.04	-.03
ST.E.	.13	.14	.14	.14	.14	.14	.14	.14	.15	.15	.15	.15

TRANSFER FUNCTION WEIGHTS

LAG	SCCF(X(I),Y(I+K)) *SY/SX	*SX/SY	SCCF(Y(I),X(I+K)) *SY/SX	*SX/SY
0	521.77630	.00011	521.77630	.00011
1	-404.30124	-.00010	-506.00400	-.00010
2	360.15360	.00000	332.30307	.00007
3	-300.56454	-.00008	-244.30622	-.00005
4	351.67446	.00007	152.00533	.00003
5	-228.97710	-.00006	25.70270	.00001
6	180.43002	.00004	31.01531	.00001
7	-196.55474	-.00004	-43.42000	-.00001
8	118.00268	.00002	-74.17005	-.00002
9	-100.14286	-.00002	108.52173	.00003
10	20.52670	.00001	-187.30400	-.00004
11	100.11148	.00002	81.06103	.00002
12	-24.16302	-.00000	-20.02076	-.00001
13	7.55167	.00000	-4.70400	-.00000
14	31.56373	.00001	63.00042	.00002
15	-47.01732	-.00001	-87.71220	-.00002
16	-0.00425	-.00000	102.20100	.00004
17	40.00045	.00001	-353.33025	-.00007
18	-10.21506	-.00000	370.00000	.00008
19	-26.35601	-.00001	-225.10002	-.00006
20	0.22317	.00000	216.13177	.00004
21	-25.73022	-.00001	-283.30300	-.00006
22	62.10061	.00001	227.02438	.00005
23	-82.46457	-.00002	-70.05718	-.00002
24	81.53711	.00002	-71.00503	-.00001

WHERE X(I) IS THE FIRST SERIES, Y(I) THE SECOND SERIES, SX THE STANDARD ERROR OF X(I), AND SY THE STANDARD ERROR OF Y(I)


PLOT OF SERIAL CORRELATION
LAG
CORR.
-1.0 -.8 -.6 -.4 -.2 .0 .2 .4 .6 .8 1.0

```
  ARIMA        VARIABLE IS ACCIBAM.
               ARORDERS ARE '(1,2)'.
               ARVALUES = -.2, -.25.
               CENTERED./                                         ACF

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACCIBAM
INPUT  VARIABLE = NOISE


  INDEP        VARIABLE IS PPI.
               UPORDERS = '(0,1)'.
               UPVALUES = 88.25, -88.0./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACCIBAM
INPUT  VARIABLE = NOISE    PPI


  ESTIMATION   RESIDUALS IS RYX.
               METHOD IS CLS./


ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN  .1000E-04


SUMMARY OF THE MODEL

OUTPUT VARIABLE -- ACCIBAM
INPUT VARIABLES -- NOISE    PPI

VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES

ACCIBAM    RANDOM    REMOVED  1-  81

PPI        RANDOM             1-  81

PARAMETER VARIABLE   TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1   ACCIBAM     AR      1      1      .7282       .1180      6.17
      2   ACCIBAM     AR      1      2      .1522       .1170      1.29
      3   PPI         UP      1      0    88.4828     80.3518      1.10
      4   PPI         UP      1      1   -86.1188     80.8822     -1.08

RESIDUAL SUM OF SQUARES  =  20822728.787342
DEGREES OF FREEDOM       =               74
RESIDUAL MEAN SQUARE     =    279888.837887
```

```
ACF          VARIABLE IS RYX./

NUMBER OF OBSERVATIONS               =          78
MEAN OF THE (DIFFERENCED) SERIES     =    -10.1000
STANDARD ERROR OF THE MEAN           =     50.2716
T-VALUE OF MEAN (AGAINST ZERO)       =      -.2009

AUTOCORRELATIONS

  1- 12    -.03 -.10  0.0 -.03  .07  .21 -.04 -.06  .11 -.02  .17  .06
  ST.E.     .11  .11  .12  .12  .12  .12  .12  .12  .12  .12  .12  .13

 13- 24     0.0  .01 -.03 -.11  .04  .10  .05  .05 -.10 -.05  .02  .05
  ST.E.     .13  .13  .13  .13  .13  .13  .13  .13  .13  .13  .13  .13

 25- 36     .11  .06 -.19 -.17  .14  .04  .04  .03 -.17 -.06  .04 -.03
  ST.E.     .13  .13  .13  .14  .14  .14  .14  .14  .14  .14  .15  .15

PLOT OF SERIAL CORRELATION

             -1.0  -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                        I
  1   -.027                        +   XI    +
  2   -.193                        +XXXXXI    +
  3   -.002                        +    I    +
  4   -.032                        +   XI    +
  5    .071                        +    IXX  +
  6    .213                        +    IXXXXX+
  7   -.040                        +   XI    +
  8   -.064                        +  XXI    +
  9    .100                        +    IXXX +
 10   -.022                        +   XI    +
 11    .170                        +    IXXXX +
 12    .057                        +    IX   +
 13    .004                        +    I    +
 14    .011                        +    I    +
 15   -.028                        +   XI    +
 16   -.113                        + XXXI    +
 17    .036                        +    IX   +
 18    .104                        +    IXXX +
 19    .055                        +    IX   +
 20    .053                        +    IX   +
 21   -.068                        +  XXI    +
 22   -.052                        +   XI    +
 23    .017                        +    I    +
 24    .047                        +    IX   +
 25    .111                        +    IXXX +
 26    .062                       +     IX     +
 27   -.188                       + XXXXXI     +
 28   -.174                       +  XXXXI     +
 29    .137                       +     IXXX   +
 30    .040                       +     IX     +
 31    .044                       +     IX     +
 32    .029                       +     IX     +
 33   -.171                       +  XXXXI     +
 34   -.060                       +    XI     +
 35    .037                       +     IX     +
 36   -.026                       +    XI     +
```

```
NUMBER OF OBSERVATIONS              =          70
MEAN OF THE (DIFFERENCED) SERIES    =    -10.1000
STANDARD ERROR OF THE MEAN          =     00.2716
T-VALUE OF MEAN (AGAINST ZERO)      =      -.2000

PARTIAL AUTOCORRELATIONS

  1- 12     -.03 -.10 -.01 -.07  .07  .21  0.0  .02  .11 -.02  .20  .03
  ST.E.      .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11

 13- 24      11  .04 -.04 -.13 -.00  .01  .06  .04 -.05 -.04 -.06 -.03
  ST.E.      .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11

 25- 36      .12  .10 -.00 -.10  .03 -.06  .01  .06 -.07 -.01 -.09 -.09
  ST.E.      .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11

PLOT OF SERIAL CORRELATION

            -1.0   -.8   -.6   -.4   -.2   .0    .2    .4    .6    .8   1.0
LAG   CORR.   +-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
                                            I
  1   -.027                           +    XI     +
  2   -.194                           +XXXXXI     +
  3   -.014                           +     I     +
  4   -.073                           +   XXI     +
  5    .067                           +     IXX   +
  6    .207                           +     IXXXXX+
  7    .004                           +     I     +
  8    .017                           +     I     +
  9    .114                           +     IXXX  +
 10   -.016                           +     I     +
 11    .188                           +     IXXXXX+
 12    .027                           +     IX    +
 13    .107                           +     IXXX  +
 14    .037                           +     IX    +
 15   -.044                           +    XI     +
 16   -.134                           +  XXXI     +
 17   -.076                           +   XXI     +
 18    .014                           +     I     +
 19    .047                           +     IX    +
 20    .042                           +     IX    +
 21   -.048                           +    XI     +
 22   -.043                           +    XI     +
 23   -.052                           +    XI     +
 24   -.027                           +    XI     +
 25    .117                           +     IXXX  +
 26    .102                           +     IXXX  +
 27   -.076                           +   XXI     +
 28   -.176                           + XXXXI     +
 29    .033                           +     IX    +
 30   -.056                           +    XI     +
 31    .000                           +     I     +
 32    .051                           +     IX    +
 33   -.074                           +   XXI     +
 34   -.000                           +     I     +
 35   -.087                           +   XXI     +
 36   -.079                           +   XXI     +
```

```
ARIMA        VARIABLE IS PPI.
             DFORDER IS 1.
             ARORDERS ARE '(3,12)'.
             ARVALUES = .2724, .3007.
             MAORDERS ARE '(1), (6)'.
             MAVALUES = -.8461, -.2102.
             CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = PPI
INPUT  VARIABLE = NOISE


 FORECAST     CASES ARE 24.  JOIN./


 FORECAST ON VARIABLE PPI       FROM TIME PERIOD    82
```

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	299.71711	.07926	
83	299.64300	1.00611	
84	299.25807	2.40118	
85	299.56000	3.11214	
86	299.42105	3.72724	
87	299.30536	4.38746	
88	300.40352	5.02070	
89	300.43742	5.53564	
90	300.20000	6.20772	
91	300.40361	6.75465	
92	300.75003	7.26520	
93	300.90367	7.74796	
94	301.17540	8.33370	
95	301.22125	8.86664	
96	301.13071	9.55738	
97	301.30000	10.10216	
98	301.26747	10.81310	
99	301.23549	11.43656	
100	301.65320	12.07824	
101	301.65450	12.60826	
102	301.56156	13.20196	
103	301.77062	13.80457	
104	301.07551	14.45000	
105	301.03601	15.01647	

```
STANDARD ERROR =  .070265      (BY CONDITIONAL METHOD  )


 PS
```

```
PSIWEIGHT     MAXPSI = 48./

48 PSI-WEIGHTS ARE STORED


ERASE         MODEL./

UNIVARIATE TIME SERIES MODEL ERASED


 ARIMA        VARIABLE IS ACC13AM.
              ARORDERS ARE '(1,2)'.
              ARVALUES = .7282, .1822.
              CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE


 INDEP        VARIABLE IS PPI.
              UPORDERS = '(0,1)'.
              UPVALUES = 65.403, -65.119./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE    PPI


 FORECAST     CASES = 48.  JOIN./
```

FORECAST ON VARIABLE ACCIBAM FROM TIME PERIOD 82

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	4673.61710	618.03529	
83	4452.48011	782.12730	
84	4248.12182	886.76400	
85	4126.04710	940.88873	
86	3946.61385	996.38714	
87	3829.70044	1036.88000	
88	3700.47404	1068.00771	
89	3600.06870	1083.22548	
90	3488.26782	1112.31406	
91	3436.00261	1127.24340	
92	3351.40048	1138.04032	
93	3282.44001	1148.18850	
94	3230.26003	1155.00537	
95	3187.78840	1161.53091	
96	3112.07401	1166.00001	
97	3086.31045	1168.73812	
98	3035.03782	1172.61000	
99	3002.18112	1174.07634	
100	3001.00025	1176.00002	
101	2948.11081	1178.12003	
102	2918.28537	1179.24027	
103	2917.33003	1180.14771	
104	2801.01157	1180.05512	
105	2871.70004	1181.41782	

BASED ON THE AVAILABLE DATA, ONLY 24 FORECASTS CAN BE MADE

STANDARD ERROR = 615.374 (BY CONDITIONAL METHOD)

```
ARIMA          VARIABLE IS PPI.
               OFORDER IS 1.
               ARORDERS ARE '(3,12)'.
               ARVALUES = .2724, .3887.
               MAORDERS ARE '(1), (5)'.
               MAVALUES = -.8461, -.2982.
               CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = PPI
INPUT  VARIABLE = NOISE

  ESTIMATION   RESIDUALS = RX.
               METHOD IS CLS./

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN  .1000E-04


SUMMARY OF THE MODEL

OUTPUT VARIABLE -- PPI
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES
                                                  1
PPI         RANDOM    REMOVED  1-  81   (1-B  )

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.   T-RATIO
      1   PPI          MA      1       1    -.8800       .0664    -13.24
      2   PPI          MA      2       5    -.3167       .1308     -2.42
      3   PPI          AR      1       3     .2982       .1152      2.59
      4   PPI          AR      1      12     .4880       .1085      4.54

RESIDUAL SUM OF SQUARES  =        54.451834
DEGREES OF FREEDOM       =               64
RESIDUAL MEAN SQUARE     =          .850807


  FILTER       VARIABLE IS ACC13AM.
               RESIDUALS = RY./


RESIDUAL MEAN SQUARE     =   4080178.811398

VARIABLE ACC13AM  IS FILTERED. RESULTS ARE STORED IN VARIABLE RY
```

```
ACF          VARIABLE IS RY.  MAXLAG IS 20./

NUMBER OF OBSERVATIONS               =          81
MEAN OF THE (DIFFERENCED) SERIES     =     -3.2827
STANDARD ERROR OF THE MEAN           =    205.8347
T-VALUE OF MEAN (AGAINST ZERO)       =      -.0187

AUTOCORRELATIONS

  1- 12     -.88  .78 -.72  .64 -.55  .45 -.35  .26 -.18  .13 -.08  .03
 ST.E.       .11  .18  .22  .25  .27  .28  .29  .29  .30  .30  .30  .30

 13- 20     -.07  .11 -.10  .10 -.10  .11 -.11  .10
 ST E.       .30  .30  .30  .30  .30  .30  .30  .30

PLOT OF SERIAL CORRELATION

               -1.0  -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG    CORR.   +----+----+----+----+----+----+----+----+----+----+
                                          I
  1   -.883     XXXXXXXXXXXXXXXXXX+XXXXI    +
  2    .785                      +     IXXXXXXXXX+XXXXXXXXXX
  3   -.720          XXXXXXX+XXXXXXXXXI            +
  4    .640                  +         IXXXXXXXXXXX+XXXX
  5   -.554               X+XXXXXXXXXXXXI              +
  6    .454               +            IXXXXXXXXXXX  +
  7   -.353               +      XXXXXXXXXI            +
  8    .261               +            IXXXXXXX        +
  9   -.182              +           XXXXXI             +
 10    .126              +                IXXX          +
 11   -.063              +                XXI           +
 12    .026              +                IX            +
 13   -.072              +                XXI           +
 14    .100              +                IXXX          +
 15   -.101              +               XXXI           +
 16    .080              +                IXX           +
 17   -.103              +               XXXI           +
 18    .112              +                IXXX          +
 19   -.100              +               XXXI           +
 20    .100              +                IXXX          +
```

```
PACF          VARIABLE IS RY.  MAXLAG IS 20./

NUMBER OF OBSERVATIONS              =         81
MEAN OF THE (DIFFERENCED) SERIES    =    -3.2027
STANDARD ERROR OF THE MEAN          =   203.8347
T-VALUE OF MEAN (AGAINST ZERO)      =     -.0157

PARTIAL AUTOCORRELATIONS

  1- 12     -.80 -.16 -.24 -.21 -.04 -.23 -.02 -.13 -.08  .02  .07  .10
 ST.E.       .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11

 13- 20     -.36 -.12  .03 -.12  .03 -.08  .06  .01
 ST.E.       .11  .11  .11  .11  .11  .11  .11  .11

PLOT OF SERIAL CORRELATION

               -1.0 -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                          I
  1   -.803    XXXXXXXXXXXXXXXXXX+XXXXI    +
  2   -.163                     +XXXXI    +
  3   -.240                    X+XXXXI    +
  4   -.207                     XXXXXI    +
  5   -.044                     +    XI    +
  6   -.228                    X+XXXXI    +
  7   -.017                     +     I    +
  8   -.130                     +  XXXI    +
  9   -.076                     +   XXI    +
 10    .016                     +     I    +
 11    .072                     +     IXX  +
 12    .179                     +     IXXXX+
 13   -.357                 XXXX+XXXXI    +
 14   -.120                     +  XXXI    +
 15    .033                     +     IX   +
 16   -.125                     +  XXXI    +
 17    .026                     +     IX   +
 18   -.085                     +   XXI    +
 19    .061                     +     IXX  +
 20    .005                     +     I    +
```

CCF VARIABLES ARE RX,RY. MAXLAG IS 20./

EFFECTIVE NUMBER OF OBSERVATIONS = 80

CORRELATION OF RX AND RY IS .24

CROSS CORRELATIONS OF RX (I) AND RY (I+K)

1- 12	-.22	.17	-.14	.16	-.10	.00	-.00	.06	-.05	.01	.06	-.01
ST.E.	.12	.12	.12	.13	.13	.13	.13	.13	.13	.13	.13	.13
13- 20	0.0	.01	-.02	0.0	.02	-.01	-.01	0.0				
ST.E.	.13	.14	.14	.14	.14	.14	.14	.14				

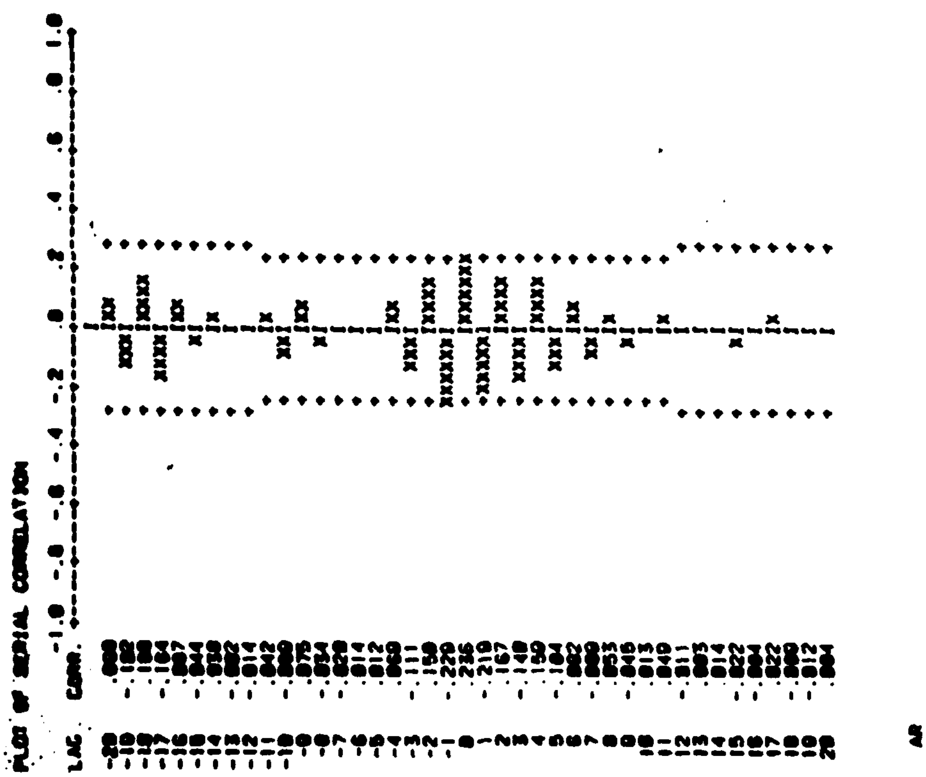
CROSS CORRELATIONS OF RY (I) AND RX (I+K)

1- 12	-.23	.15	-.11	.07	.01	.01	-.02	-.03	.00	-.00	.04	-.01
ST.E.	.12	.12	.12	.13	.13	.13	.13	.13	.13	.13	.13	.13
13- 20	0.0	.04	-.04	.00	-.16	.17	-.10	.10				
ST.E.	.13	.14	.14	.14	.14	.14	.14	.14				

TRANSFER FUNCTION WEIGHTS

LAG	SCCF(X(I),Y(I+K)) *SY/SX	SCCF(X(I),Y(I+K)) *SX/SY	SCCF(Y(I),X(I+K)) *SY/SX	SCCF(Y(I),X(I+K)) *SX/SY
0	521.77638	.00011	521.77638	.00011
1	-484.38124	-.00010	-506.00460	-.00010
2	360.15360	.00008	332.30307	.00007
3	-300.55454	-.00006	-244.30622	-.00005
4	351.67446	.00007	152.06533	.00003
5	-228.07710	-.00005	25.70270	.00001
6	100.43002	.00004	31.01531	.00001
7	-196.65474	-.00004	-43.42000	-.00001
8	118.00268	.00002	-74.17606	-.00002
9	-100.14256	-.00002	106.62173	.00003
10	20.52670	.00001	-107.30400	-.00004
11	100.11148	.00002	91.06193	.00002
12	-24.16382	-.00000	-20.02076	-.00001
13	7.96167	.00000	-4.79400	-.00000
14	31.56373	.00001	83.05042	.00002
15	-47.81732	-.00001	-97.71220	-.00002
16	-9.08425	-.00000	192.28100	.00004
17	40.60045	.00001	-303.33025	-.00007
18	-19.21500	-.00000	370.00000	.00008
19	-26.35601	-.00001	-225.10602	-.00005
20	8.22317	.00000	216.13177	.00004

WHERE X(I) IS THE FIRST SERIES, Y(I) THE SECOND SERIES, SX THE STANDARD ERROR OF X(I), AND SY THE STANDARD ERROR OF Y(I)


PLOT OF SERIAL CORRELATION
LAG
CORR.
-1.0 -.8 -.6 -.4 -.2 .0 .2 .4 .6 .8 1.0
AR

ACF

```
ARIMA        VARIABLE IS ACC13AM.
             ARORDERS ARE '(1,6)'.
             ARVALUES = .7882, .2804.
             CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE


  INDEP        VARIABLE IS PPI./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE    PPI


  ESTIMATION   RESIDUALS IS RYX.
               METHOD IS CLS./


ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN EACH ESTIMATE LESS THAN  .1000E-03


SUMMARY OF THE MODEL

OUTPUT VARIABLE -- ACC13AM
INPUT VARIABLES -- NOISE    PPI

VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES

ACC13AM    RANDOM    REMOVED  1-  81

PPI        RANDOM             1-  81

PARAMETER VARIABLE   TYPE  FACTOR  ORDER ESTIMATE   ST. ERR.  T-RATIO
      1   ACC13AM     AR      1       1     .7531     .0877     8.59
      2   ACC13AM     AR      1       6     .1110     .0844     1.33

RESIDUAL SUM OF SQUARES  =  27400134.407300
DEGREES OF FREEDOM       =               73
RESIDUAL MEAN SQUARE     =    375344.300048
```

```
ACF          VARIABLE IS RYX.  MAXLAG IS 20./

NUMBER OF OBSERVATIONS                  =          75
MEAN OF THE (DIFFERENCED) SERIES        =    -40.3835
STANDARD ERROR OF THE MEAN              =     70.1887
T-VALUE OF MEAN (AGAINST ZERO)          =      -.5757

AUTOCORRELATIONS

 1- 12    -.07 -.11  .12  .04  .08  .10 -.08 -.04  .17 -.08  .08  .12
 ST.E.     .12  .12  .12  .12  .12  .12  .12  .12  .12  .13  .13  .13

13- 20     .05  .04  .01 -.07  .03  .11  .01  .06
 ST.E.     .13  .13  .13  .13  .13  .13  .13  .13

PLOT OF SERIAL CORRELATION

              -1.0 -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR.    +----+----+----+----+----+----+----+----+----+----+
                                        I
  1   -.069                        +  XXI   +
  2   -.112                        + XXXI   +
  3    .124                        +    IXXX +
  4    .035                        +    IX   +
  5    .084                        +    IXX  +
  6    .103                        +    IXXXXX+
  7   -.084                        +  XXI    +
  8   -.037                        +   XI    +
  9    .170                        +    IXXXX +
 10   -.065                        +  XXI    +
 11    .081                        +    IXX  +
 12    .124                        +    IXXX +
 13    .046                        +    IX   +
 14    .040                        +    IX   +
 15    .012                        +    I    +
 16   -.073                        +  XXI    +
 17    .032                        +    IX   +
 18    .113                        +    IXXX +
 19    .012                       +     I     +
 20    .064                       +     IXX   +
```

```
PACF          VARIABLE IS RVX.  MAXLAG IS 20./

NUMBER OF OBSERVATIONS                 =          75
MEAN OF THE (DIFFERENCED) SERIES       =    -40.3835
STANDARD ERROR OF THE MEAN             =     70.1867
T-VALUE OF MEAN (AGAINST ZERO)         =      -.5757

PARTIAL AUTOCORRELATIONS

  1- 12     -.07 -.12  .11  .04  .12  .20 -.04 -.05  .10 -.07  .10  .09
 ST.E.       .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .12

 13- 20      .12  .06 -.04 -.09 -.07  .03  .06  .10
 ST.E.       .12  .12  .12  .12  .12  .12  .12  .12

PLOT OF SERIAL CORRELATION

             -1.0  -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR   +----+----+----+----+----+----+----+----+----+----+
                                        I
  1   -.069                        +  XXI    +
  2   -.117                        + XXXI    +
  3    .100                        +    IXXX +
  4    .048                        +    IX   +
  5    .118                        +    IXXX +
  6    .201                        +    IXXXXX+
  7   -.043                        +   XI    +
  8   -.033                        +   XI    +
  9    .104                        +    IXXX +
 10   -.074                        +  XXI    +
 11    .065                        +    IXX  +
 12    .080                        +    IXX  +
 13    .122                        +    IXXX +
 14    .055                        +    IX   +
 15   -.037                        +   XI    +
 16   -.080                        +  XXI    +
 17   -.066                        +  XXI    +
 18    .031                        +    IX   +
 19    .052                        +    IX   +
 20    .069                        +    IXX  +
```

```
ARIMA        VARIABLE IS PPI.
             DFORDER IS 1.
             ARORDERS ARE '(3,12)'.
             ARVALUES = .2724, .3687.
             MAORDERS ARE '(1), (6)'.
             MAVALUES = -.0461, -.2302.
             CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = PPI
INPUT  VARIABLE = NOISE


 FORECAST    CASES ARE 24.  JOIN./
```

FORECAST ON VARIABLE PPI   FROM TIME PERIOD   82

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	299.71711	.97826	
83	299.84309	1.80811	
84	299.25887	2.40110	
85	299.56800	3.11214	
86	299.42105	3.72724	
87	299.30536	4.36746	
88	300.40352	5.02070	
89	300.43742	5.63654	
90	300.20000	6.20772	
91	300.40361	6.75465	
92	300.75093	7.26520	
93	300.98367	7.74708	
94	301.17540	8.33370	
95	301.22125	8.86564	
96	301.13971	9.36738	
97	301.30000	10.10216	
98	301.26747	10.61310	
99	301.23540	11.43856	
100	301.85320	12.07824	
101	301.06460	12.60626	
102	301.56156	13.20106	
103	301.77062	13.80457	
104	301.07551	14.46800	
105	301.03081	15.01647	

STANDARD ERROR = .978266   (BY CONDITIONAL METHOD)

PSIWEIGHT

```
PSIWEIGHT    MAXPSI = 48./

 48 PSI-WEIGHTS ARE STORED


 ERASE       MODEL./

UNIVARIATE TIME SERIES MODEL ERASED


 ARIMA       VARIABLE IS ACC13AM.
             ARORDERS ARE '(1,8)'.
             ARVALUES = .7882, .2684.
             CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE


 INDEP       VARIABLE IS PPI./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE    PPI


 FORECAST    CASES = 48.  JOIN./
```

FORECAST ON VARIABLE ACC+SAM FROM TIME PERIOD 82

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	4874.30056	629.15431	
83	4716.80110	778.88217	
84	4732.38630	833.03166	
85	4808.38206	862.40782	
86	4822.19510	876.00852	
87	4838.04370	894.02721	
88	4862.04100	910.22527	
89	4836.82824	984.57154	
90	4622.27444	1000.35306	
91	4577.03647	1043.30340	
92	4524.12014	1060.08574	
93	4516.04130	1086.53454	
94	4510.00673	1100.61856	
95	4514.00110	1120.00640	
96	4506.00034	1152.04741	
97	4480.30060	1177.61342	
98	4461.45031	1200.34033	
99	4448.66011	1218.70000	
100	4426.03000	1237.40460	
101	4415.17070	1254.01400	
102	4404.69536	1272.42460	
103	4392.76300	1290.27613	
104	4377.83060	1307.00362	
105	4368.32313	1324.58785	

BASED ON THE AVAILABLE DATA, ONLY 24 FORECASTS CAN BE MADE

STANDARD ERROR = 629.154 (BY CONDITIONAL METHOD)

-END

```
ARIMA         VARIABLE IS PPI.
              DFORDER IS 1.
              ARORDERS ARE '(3,12)'.
              ARVALUES = .2724, .4387.
              MAORDERS ARE '(1), (5)'.
              MAVALUES = -.8160, -.3071.
              CENTERED./

ESTIMATION    RESIDUALS = RX.
              METHOD IS CLS /


ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN  .1000E-04


SUMMARY OF THE MODEL

OUTPUT VARIABLE -- PPI
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN      TIME    DIFFERENCES
                                              1
PPI        RANDOM    REMOVED  1-  81  (1-B  )

PARAMETER VARIABLE   TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.  T-RATIO
     1   PPI          MA     1       1     -.8780     .0674    -13.05
     2   PPI          MA     2       5     -.3160     .1304     -2.43
     3   PPI          AR     1       3      .2985     .1150      2.60
     4   PPI          AR     1      12      .4065     .1004      4.54

RESIDUAL SUM OF SQUARES  =         54.451355
DEGREES OF FREEDOM       =                64
RESIDUAL MEAN SQUARE     =           .850802


FILTER        VARIABLE IS ACC13AM.
              RESIDUALS = RY./

RESIDUAL MEAN SQUARE     =   4830066.062295

VARIABLE ACC13AM  IS FILTERED. RESULTS ARE STORED IN VARIABLE RY


ACF
```

```
ACF          VARIABLE IS RY.  MAXLAG IS 20./

NUMBER OF OBSERVATIONS              =          81
MEAN OF THE (DIFFERENCED) SERIES    =     -3.1801
STANDARD ERROR OF THE MEAN          =    205.1087
T-VALUE OF MEAN (AGAINST ZERO)      =      -.0156

AUTOCORRELATIONS

  1- 12     -.90  .78 -.72  .64 -.56  .45 -.35  .26 -.18  .12 -.06  .02
  ST.E.      .11  .18  .22  .25  .27  .28  .29  .29  .30  .30  .30  .30

 13- 20     -.07  .11 -.10  .10 -.10  .11 -.11  .10
  ST.E.      .30  .30  .30  .30  .30  .30  .30  .30

PLOT OF SERIAL CORRELATION

             -1.0  -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                        I
  1   -.902    XXXXXXXXXXXXXXXXXX+XXXXI    +
  2    .784                  +          IXXXXXXXX+XXXXXXXXXX
  3   -.710         XXXXXXX+XXXXXXXXXXI          +
  4    .638                +            IXXXXXXXXXXX+XXXX
  5   -.551              X+XXXXXXXXXXXXI              +
  6    .451              +              IXXXXXXXXXXX  +
  7   -.350              +     XXXXXXXXXI              +
  8    .258              +              IXXXXXX        +
  9   -.170             +           XXXXI               +
 10    .123             +               IXXX            +
 11   -.060             +              XI               +
 12    .023             +               IX              +
 13   -.070             +             XXI               +
 14    .107             +               IXXX            +
 15   -.080             +             XXI               +
 16    .087             +               IXX             +
 17   -.102             +            XXXI               +
 18    .111             +               IXXX            +
 19   -.100             +            XXXI               +
 20    .100             +               IXX             +
```

PACF

```
PACF          VARIABLE IS RY.  MAXLAG IS 20./

NUMBER OF OBSERVATIONS              =         81
MEAN OF THE (DIFFERENCED) SERIES    =    -3.1081
STANDARD ERROR OF THE MEAN          =   283.1867
T-VALUE OF MEAN (AGAINST ZERO)      =     -.0106

PARTIAL AUTOCORRELATIONS

  1- 12     -.88 -.18 -.24 -.21 -.04 -.23 -.02 -.13 -.08  .01  .07  .10
 ST.E.       .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11

 13- 20     -.36 -.12  .03 -.12  .03 -.09  .06  .01
 ST.E.       .11  .11  .11  .11  .11  .11  .11  .11

PLOT OF SERIAL CORRELATION

             -1.0  -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR    +----+----+----+----+----+----+----+----+----+----+
                                         I
  1   -.882     XXXXXXXXXXXXXXXXXX+XXXXI    +
  2   -.163                       +XXXXI    +
  3   -.248                      X+XXXXI    +
  4   -.207                       XXXXXI    +
  5   -.044                       +   XI    +
  6   -.228                      X+XXXXI    +
  7   -.017                       +    I    +
  8   -.131                       +  XXXI    +
  9   -.075                       +   XXI    +
 10    .015                       +    I    +
 11    .072                       +    IXX  +
 12    .170                       +    IXXXX+
 13   -.358                   XXXX+XXXXI    +
 14   -.110                       +  XXXI    +
 15    .033                       +    IX   +
 16   -.125                       +  XXXI    +
 17    .025                       +    IX   +
 18   -.095                       +   XXI    +
 19    .062                       +    IXX  +
 20    .005                       +    I    +
```

CCF VARIABLES ARE RX,RY. MAXLAG IS 20./

EFFECTIVE NUMBER OF OBSERVATIONS = 80

CORRELATION OF RX AND RY IS .24

CROSS CORRELATIONS OF RX (I) AND RY (I+K)

1- 12	-.22	.17	-.14	.16	-.10	.00	-.00	.06	-.04	.01	.05	-.01
ST.E.	.12	.12	.12	.13	.13	.13	.13	.13	.13	.13	.13	.13
13- 20	0.0	.01	-.02	0.0	.02	-.01	-.01	0.0				
ST.E.	.13	.14	.14	.14	.14	.14	.14	.14				

CROSS CORRELATIONS OF RY (I) AND RX (I+K)

1- 12	-.23	.15	-.11	.07	.01	.01	-.02	-.03	.00	-.00	.04	-.01
ST.E.	.12	.12	.12	.13	.13	.13	.13	.13	.13	.13	.13	.13
13- 20	0.0	.04	-.04	.00	-.16	.17	-.10	.10				
ST.E.	.13	.14	.14	.14	.14	.14	.14	.14				

TRANSFER FUNCTION WEIGHTS

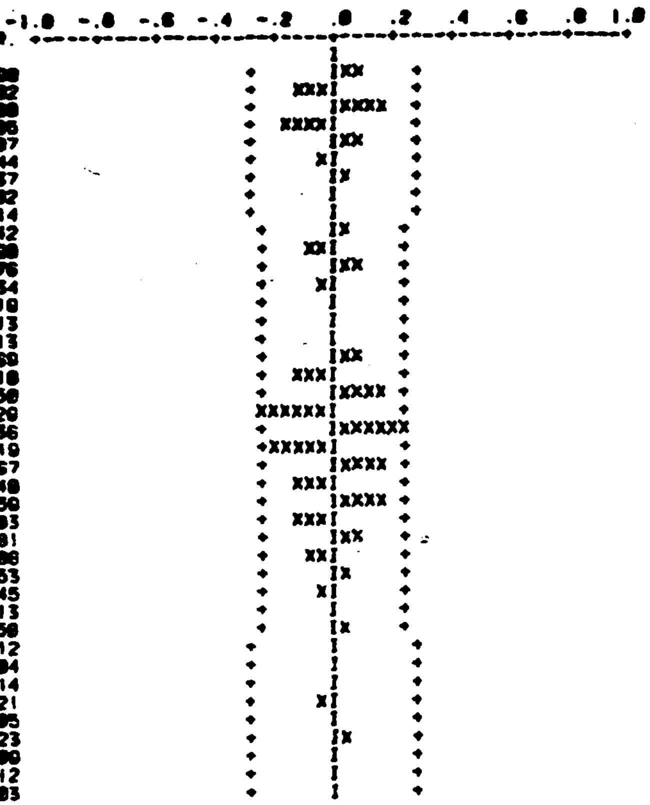
LAG	SCCF(X(I),Y(I+K)) *SY/SX	*SX/SY	SCCF(Y(I),X(I+K)) *SY/SX	*SX/SY
0	510.14377	.00011	510.14377	.00011
1	-481.70010	-.00018	-504.41036	-.00010
2	366.60223	.00008	330.00204	.00007
3	-307.14245	-.00006	-242.20012	-.00005
4	340.27024	.00007	150.01023	.00003
5	-226.64404	-.00005	27.64245	.00001
6	170.17000	.00004	20.40056	.00001
7	-104.30105	-.00004	-42.10700	-.00001
8	115.78100	.00002	-76.30640	-.00002
9	-90.26335	-.00002	167.50606	.00003
10	27.66060	.00001	-100.30125	-.00004
11	110.73370	.00002	82.84210	.00002
12	-25.71300	-.00001	-30.66367	-.00001
13	8.91376	.00000	-4.84170	-.00000
14	30.22010	.00001	82.32726	.00002
15	-46.67077	-.00001	-86.00700	-.00002
16	-10.40529	-.00000	101.50464	.00004
17	50.30002	.00001	-362.71345	-.00007
18	-10.04325	-.00000	370.30002	.00008
19	-25.70675	-.00001	-224.71057	-.00005
20	7.85421	.00000	216.04670	.00004

WHERE X(I) IS THE FIRST SERIES, Y(I) THE SECOND SERIES, SX THE STANDARD ERROR OF X(I), AND SY THE STANDARD ERROR OF Y(I)

PL

PLOT OF SERIAL CORRELATION

LAG	CORR.
-20	.080
-19	-.102
-18	.100
-17	-.105
-16	.067
-15	-.044
-14	.037
-13	-.002
-12	-.014
-11	.042
-10	-.060
-9	.076
-8	-.034
-7	-.010
-6	.013
-5	.013
-4	.060
-3	-.110
-2	.150
-1	-.220
0	.236
1	-.210
2	.167
3	-.140
4	.150
5	-.103
6	.061
7	-.066
8	.053
9	-.045
10	.013
11	.050
12	-.012
13	.004
14	.014
15	-.021
16	-.005
17	.023
18	-.000
19	-.012
20	.003



```
ARIMA          VARIABLE IS ACC13AM.
               ARORDERS ARE '(2,6)'.
               ARVALUES = .7746, .2.
               MAORDERS ARE '(1)'.
               MAVALUES = -.8851.
               CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE


 INDEP         VARIABLE IS PPI.
               UPORDERS = '(5,6)'.
               UPVALUES = 75.4, -74.8./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE     PPI


 ESTIMATION    RESIDUALS IS RYX.
               METHOD IS CLS./


ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN  .1000E-04


SUMMARY OF THE MODEL

OUTPUT VARIABLE -- ACC13AM
INPUT VARIABLES -- NOISE    PPI

VARIABLE  VAR  TYPE  MEAN      TIME     DIFFERENCES

ACC13AM    RANDOM    REMOVED  1-  81

PPI        RANDOM             1-  81

PARAMETER VARIABLE     TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
     1    ACC13AM      MA       1       1    -.9072       .0712    -12.74
     2    ACC13AM      AR       1       2     .5440       .1206      4.50
     3    ACC13AM      AR       1       6     .2418       .1045      2.31
     4    PPI          UP       1       5   73.3874     63.0126      1.16
     5    PPI          UP       1       6  -70.5618     63.7342     -1.11


RESIDUAL SUM OF SQUARES  =  22378880.188244
DEGREES OF FREEDOM       =               84
RESIDUAL MEAN SQUARE     =    348512.843636


 ACF           VARIABLE IS RYX.
```

```
- ACF           VARIABLE IS RYX.  MAXLAG IS 20./

NUMBER OF OBSERVATIONS              =          69
MEAN OF THE (DIFFERENCED) SERIES    =    -44.0821
STANDARD ERROR OF THE MEAN          =     68.0300
T-VALUE OF MEAN (AGAINST ZERO)      =      -.6472

AUTOCORRELATIONS

  1- 12     -.18 -.04  .07  .11  .03 -.01  .10  .03  .02 -.10  .13  .05
  ST.E.      .12  .12  .12  .12  .13  .13  .13  .13  .13  .13  .13  .13

 13- 20      .03 -.01  .06 -.08 -.05  .10 -.02  .03
  ST.E.      .13  .13  .13  .13  .13  .13  .13  .13

PLOT OF SERIAL CORRELATION

              -1.0  -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR.    +----+----+----+----+----+----+----+----+----+----+
                                        I
  1   -.181                        +XXXXXI    +
  2   -.030                        +     XI    +
  3    .068                        +      IXX  +
  4    .111                        +      IXXX +
  5    .033                        +      IX   +
  6   -.013                        +      I    +
  7    .103                        +      IXXX +
  8    .031                        +      IX   +
  9    .010                        +      I    +
 10   -.103                        +   XXXI    +
 11    .127                        +      IXXX +
 12    .046                        +      IX   +
 13    .032                        +      IX   +
 14   -.011                        +      I    +
 15    .050                        +      IX   +
 16   -.050                        +     XI    +
 17   -.020                        +     XI    +
 18    .087                        +      IXX  +
 19   -.017                       +       I     +
 20    .032                       +       IX    +


 PACF           VARIABLE I
```

```
PACF.        VARIABLE IS RYX.  MAXLAG IS 20./

NUMBER OF OBSERVATIONS             =         80
MEAN OF THE (DIFFERENCED) SERIES   =   -44.0821
STANDARD ERROR OF THE MEAN         =   [illegible]
T-VALUE OF MEAN (AGAINST ZERO)     =     -.8472

PARTIAL AUTOCORRELATIONS

  1- 12    -.18 -.07  .05  .14  .08  .02  .10  .05  .03 -.12  .06  .05
  ST.E.     .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .12

 13- 20     .07  .01  .04 -.08 -.06  .05 -.01  .03
  ST.E.     .12  .12  .12  .12  .12  .12  .12  .12

PLOT OF SERIAL CORRELATION

             -1.0  -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                        I
  1   -.181                        +XXXXXI    +
  2   -.075                        +    XXI    +
  3    .048                        +      IX   +
  4    .136                        +      IXXX +
  5    .092                        +      IXX  +
  6    .010                        +      I    +
  7    .097                        +      IXX  +
  8    .058                        +      IX   +
  9    .038                        +      IX   +
 10   -.117                        +   XXXI    +
 11    .056                        +      IX   +
 12    .051                        +      IX   +
 13    .072                        +      IXX  +
 14    .015                        +      I    +
 15    .042                        +      IX   +
 16   -.081                        +    XXI    +
 17   -.062                        +    XXI    +
 18    .058                        +      IX   +
 19   -.006                        +      I    +
 20    .020                        +      IX   +
```

```
ARIMA          VARIABLE IS PPI.
               DFORDER IS 1.
               ARORDERS ARE '(3,12)'.
               ARVALUES = .2724, .4207.
               MAORDERS ARE '(1), (8)'.
               MAVALUES = -.8180, -.3871.
               CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = PPI
INPUT  VARIABLE = NOISE


FORECAST      CASES ARE 24.  JOIN./
```

FORECAST ON VARIABLE PPI   FROM TIME PERIOD   82

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	299.54633	.93824	
83	299.35285	1.82842	
84	299.76438	2.56365	
85	299.07868	3.21853	
86	299.84288	3.88857	
87	299.78839	4.57113	
88	299.80855	5.32707	
89	299.88884	6.01587	
90	299.80423	6.66586	
91	299.92579	7.28880	
92	300.23074	7.87238	
93	300.58848	8.42184	
94	300.86825	9.00926	
95	300.86856	9.83542	
96	300.47586	10.53088	
97	300.85163	11.26214	
98	300.95147	12.01883	
99	300.43882	12.75782	
100	301.08461	13.52782	
101	300.98861	14.27833	
102	300.82547	15.01313	
103	301.12857	15.74816	
104	301.25385	16.44285	
105	301.32744	17.12452	

STANDARD ERROR = .938230   (BY CONDITIONAL METHOD)

```
PSIWEIGHT     MAXPSI = 48./
```

```
40 PSI-WEIGHTS ARE STORED

 ERASE        MODEL./

UNIVARIATE TIME SERIES MODEL ERASED


 ARIMA        VARIABLE IS ACC13AM.
              ARORDERS ARE '(2,6)'.
              ARVALUES = .7746, .2.
              MAORDERS ARE '(1)'.
              MAVALUES = -.8831.
              CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE


 INDEP        VARIABLE IS PPI.
              UPORDERS = '(5,6)'.
              UPVALUES = 75.4, -74.8./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE    PPI


 FORECAST     CASES = 40.  JOIN./
```

FORECAST ON VARIABLE ACCISAM FROM TIME PERIOD 82

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	4936.18782	814.24400	
83	4738.04872	818.47906	
84	4860.00063	847.80487	
85	4723.87000	1038.08200	
86	4707.77086	1100.13263	
87	4800.02347	1140.47863	
88	4717.08378	1221.20847	
89	4814.80010	1273.41824	
90	4730.30070	1338.41004	
91	4683.24651	1386.00000	
92	4667.41810	1441.64738	
93	4680.96280	1482.06246	
94	4658.52712	1532.20607	
95	4544.42340	1580.71427	
96	4645.47530	1615.32433	
97	4563.01242	1650.00256	
98	4613.82483	1691.70181	
99	4524.32621	1724.85610	
100	4565.05001	1762.06104	
101	4472.03800	1792.32000	
102	4551.40228	1828.20070	
103	4453.21724	1865.04826	
104	4502.00163	1888.30063	
105	4477.54245	1915.06462	
106	4484.40415	1946.33840	
107	4398.20581	1978.37637	
108	4481.63531	1998.71847	
109	4386.21823	2022.27606	
110	4440.82346	2040.83403	

BASED ON THE AVAILABLE DATA, ONLY 29 FORECASTS CAN BE MADE

STANDARD ERROR = 814.245 (BY CONDITIONAL METHOD)

-END OF INFO

Appendix E-8

BMDP Output for Leading Indicator Transfer Function Models (with Forecasts) with Prime Rate as Input Variable

```
ARIMA          VARIABLE IS PRIME.                                        FILTER
               OFORDER IS 1.
               ARORDERS ARE '(14)'.
               ARVALUES = .3.
               MAORDERS ARE '(1,3,4)'.
               MAVALUES = -.6865, .3517, .6866.
               CENTERED./

ESTIMATION     RESIDUAL = RX.  MAXIT = 10./

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN  .1000E-04

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- PRIME
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES
                                              1
PRIME       RANDOM   REMOVED  1-  81   (1-B  )

PARAMETER VARIABLE   TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1   PRIME       MA     1       1     -.6840       .0846    -7.82
      2   PRIME       MA     1       3      .3625       .1212     2.99
      3   PRIME       MA     1       4      .5574       .1104     5.05
      4   PRIME       AR     1      14      .3063       .1371     2.23

RESIDUAL SUM OF SQUARES  =         43.446807
DEGREES OF FREEDOM       =                62
RESIDUAL MEAN SQUARE     =           .700744

ESTIMATION BY BACKCASTING METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN  .1000E-04

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- PRIME
INPUT VARIABLES -- NOISE

VARIABLE  VAR. TYPE  MEAN      TIME      DIFFERENCES
                                              1
PRIME       RANDOM   REMOVED  1-  81   (1-B  )

PARAMETER VARIABLE   TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1   PRIME       MA     1       1     -.6565       .0820    -7.96
      2   PRIME       MA     1       3      .3517       .1180     2.98
      3   PRIME       MA     1       4      .5566       .1090     5.10
      4   PRIME       AR     1      14      .3007       .1347     2.23

RESIDUAL SUM OF SQUARES  =         43.208721 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =                62
RESIDUAL MEAN SQUARE     =           .696386
```

```
FILTER        VARIABLE IS ACCISAM.
              RESIDUALS = RY./

RESIDUAL MEAN SQUARE      =   1077173.000831

VARIABLE ACCISAM  IS FILTERED. RESULTS ARE STORED IN VARIABLE RY


ACF           VARIABLE IS RY.  MAXLAG IS 20./

NUMBER OF OBSERVATIONS              =          81
MEAN OF THE (DIFFERENCED) SERIES    =    -10.0867
STANDARD ERROR OF THE MEAN          =    110.4167
T-VALUE OF MEAN (AGAINST ZERO)      =      -.0914

AUTOCORRELATIONS

  1- 12    -.66  .25 -.11  .32 -.47  .46 -.23  .10 -.09  .15 -.14  .12
  ST.E.     .11  .15  .16  .18  .17  .18  .20  .20  .20  .20  .20  .20

 13- 20    -.09  .09 -.08  .10 -.10  .10 -.06  .07
  ST.E.     .20  .20  .20  .20  .21  .21  .21  .21

PLOT OF SERIAL CORRELATION

              -1.0  -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR.   +----+----+----+----+----+----+----+----+----+----+
                                         I
  1   -.661        XXXXXXXXXXXXX+XXXXI    +
  2    .246                    +     IXXXXXX+
  3   -.110                   +   XXXI     +
  4    .322                   +      IXXXXXXXX
  5   -.473              XXXX+XXXXXXXI     +
  6    .457                  +       IXXXXXXXX+XX
  7   -.231                 +   XXXXXXI        +
  8    .097                 +        IXX       +
  9   -.091                 +      XXI         +
 10    .146                 +        IXXXX     +
 11   -.130                 +     XXXI         +
 12    .122                 +        IXXX      +
 13   -.087                 +      XXI         +
 14    .086                 +        IXX       +
 15   -.085                 +      XXI         +
 16    .098                 +        IXX       +
 17   -.099                 +      XXI         +
 18    .101                 +        IXXX      +
 19   -.064                 +       XI         +
 20    .074                 +        IXX       +
```

```
  PACF          .VARIABLE IS RV.  MAXLAG IS 20./

NUMBER OF OBSERVATIONS                =         81
MEAN OF THE (DIFFERENCED) SERIES      =   -10.0067
STANDARD ERROR OF THE MEAN            =   110.4157
T-VALUE OF MEAN (AGAINST ZERO)        =     -.0014

PARTIAL AUTOCORRELATIONS

  1- 12     -.66 -.34 -.23  .42  .01  .10  .17  .06  .08 -.14 -.03  .02
  ST.E.      .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11

 13- 20     -.02  .07 -.03  .07 -.02 -.02  .00  .13
  ST.E.      .11  .11  .11  .11  .11  .11  .11  .11

PLOT OF SERIAL CORRELATION

              -1.0  -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR     +----+----+----+----+----+----+----+----+----+----+
                                        I
  1   -.661            XXXXXXXXXXXX+XXXXI    +
  2   -.338                      XXX+XXXXI    +
  3   -.232                         X+XXXXI   +
  4    .417                          +    IXXXX+XXXXX
  5    .011                          +    I    +
  6    .178                          +    IXXXX+
  7    .174                          +    IXXXX+
  8    .050                          +    IX   +
  9    .075                          +    IXX  +
 10   -.138                          + XXXI    +
 11   -.033                          +   XI    +
 12    .010                          +    I    +
 13   -.024                          +   XI    +
 14    .067                          +    IXX  +
 15   -.020                          +   XI    +
 16    .068                          +    IXX  +
 17   -.022                          +   XI    +
 18   -.017                          +    I    +
 19    .068                          +    IXX  +
 20    .134                          +    IXXX +
```

```
CCF         VARIABLES ARE RX,RY.  MAXLAG IS 20./

EFFECTIVE NUMBER OF OBSERVATIONS =   81
CORRELATION          OF RX            AND RY          IS      .01
CROSS CORRELATIONS OF RX        (I) AND RY        (I+K)

 1- 12      -.04  .00 -.05  .02 -.05  .18 -.09  .07 -.01  .05 -.02  .07
 ST.E.       .11  .11  .11  .11  .11  .12  .12  .12  .12  .12  .12  .12

13- 20      -.06  .05  .00  0.0 -.09  .13 -.10  .05
 ST.E.       .12  .12  .12  .12  .13  .13  .13  .13
CROSS CORRELATIONS OF RY        (I) AND RX        (I+K)

 1- 12      -.05  .07 -.03  .01  0.0  .03 -.01  .03 -.01  0.0  .11 -.08
 ST.E.       .11  .11  .11  .11  .11  .12  .12  .12  .12  .12  .12  .12

13- 20       0.0 -.04  .09 -.00  .03 -.05  .00 -.14
 ST.E.       .12  .12  .12  .12  .13  .13  .13  .13

TRANSFER FUNCTION WEIGHTS

        SCCF(X(I),Y(I+K))         SCCF(Y(I),X(I+K))
 LAG    *SY/SX      *SX/SY        *SY/SX       *SX/SY

  0   14.43360      .00001    14.43360       .00001
  1  -58.30205    -.00003    -67.50692     -.00004
  2  122.07647      .00007    97.00273       .00005
  3  -70.56811    -.00004    -44.72252     -.00002
  4   20.07000      .00002     9.01000       .00000
  5  -36.15011    -.00002     -3.00276     -.00000
  6  135.00006      .00007    33.00004       .00002
  7 -117.30072    -.00006    -17.70563     -.00001
  8   97.49160      .00005    30.64400       .00002
  9  -12.02835    -.00001    -11.75611     -.00001
 10   61.06303      .00003    -2.20507     -.00000
 11  -23.70470    -.00001   153.74505       .00000
 12   99.56300      .00005  -118.57723     -.00006
 13  -77.04522    -.00004     3.12202       .00000
 14   60.46051      .00004   -51.57004     -.00003
 15  186.04900      .00006   128.03510       .00007
 16   -3.06703    -.00000  -190.43010     -.00006
 17 -120.20750    -.00007    41.03700       .00002
 18  174.02521      .00010   -70.70065     -.00004
 19 -134.60400    -.00007   120.61143       .00007
 20   60.00237      .00004  -104.30475     -.00011

 WHERE X(I) IS THE FIRST SERIES, Y(I) THE SECOND
 SERIES, SX THE STANDARD ERROR OF X(I), AND SY
 THE STANDARD ERROR OF Y(I)
!

PLOT OF SER
```

```
PLOT OF SERIAL CORRELATION

                -1.0  -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR.      +----+----+----+----+----+----+----+----+----+----+
                                           I
-20   -.144                          + XXXXI     +
-19   .[illegible]                          +     IXX   +
-18   -.0[illegible]2                       +    XI     +
-17   .0[illegible]                         +     IX    +
-16   -.[illegible]                         +   XXI     +
-15   .0[illegible]                         +     IXX   +
-14   -.0[illegible]                        +    XI     +
-13   .0[illegible]2                        +     I     +
-12   -.0[illegible]2                       +   XXI     +
-11   .114                           +     IXXX  +
-10   -.0[illegible]2                       +     I     +
 -9   -.[illegible]                         +     I     +
 -8   .020                           +     IX    +
 -7   -.013                          +     I     +
 -6   .025                           +     IX    +
 -5   -.0[illegible]3                       +     I     +
 -4   .0[illegible]7                        +     I     +
 -3   -.033                          +    XI     +
 -2   .073                           +     IXX   +
 -1   -.0[illegible]                         +   XI    +
  0   .011                            +    I    +
  1   -.037                           +   XI    +
  2   .0[illegible]1                        +     IXX   +
  3   -.052                          +    XI     +
  4   .022                           +     IX    +
  5   -.027                          +    XI     +
  6   .101                           +     IXXX  +
  7   -.0[illegible]7                       +   XXI     +
  8   .072                           +     IXX   +
  9   -.01[illegible]                       +     I     +
 10   .046                           +     IX    +
 11   -.01[illegible]                       +     I     +
 12   .074                           +     IXX   +
 13   -.057                          +    XI     +
 14   .0[illegible]1                        +     IX    +
 15   .070                           +     IXX   +
 16   -.0[illegible]3                       +     I     +
 17   -.[illegible]                         +   XXI     +
 18   .120                           +     IXXX  +
 19   -.1[illegible]                        +   XXI     +
 20   .0[illegible]2                        +     IX    +
```

ARIM

```
ARIMA          VARIABLE IS ACC13AM.
               ARORDERS ARE '(1,6)'.
               CENTERED /

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE


INDEP          VARIABLE IS PRIME./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE     PRIME


ESTIMATION     RESIDUALS IS RYX.   MAXIT = 10.
               METHOD IS CLS /


ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN  .1000E-04


SUMMARY OF THE MODEL

OUTPUT VARIABLE -- ACC13AM
INPUT VARIABLES -- NOISE     PRIME

VARIABLE  VAR. TYPE  MEAN       TIME      DIFFERENCES

ACC13AM    RANDOM    REMOVED  1-  81

PRIME      RANDOM             1-  81

PARAMETER VARIABLE    TYPE  FACTOR  ORDER ESTIMATE     ST. ERR.  T-RATIO
      1  ACC13AM       AR      1      1      .7501      .0887     8.46
      2  ACC13AM       AR      1      6      .1048      .0861     1.22

RESIDUAL SUM OF SQUARES  =  27423564.834341
DEGREES OF FREEDOM       =                73
RESIDUAL MEAN SQUARE     =    375665.280744


ACF            VARIABLE IS RYX.
```

```
ACF          VARIABLE IS RYX.  MAXLAG IS 20 /

NUMBER OF OBSERVATIONS             =          75
MEAN OF THE (DIFFERENCED) SERIES   =     -0.4083
STANDARD ERROR OF THE MEAN         =     78.2040
T-VALUE OF MEAN (AGAINST ZERO)     =      -.1302

AUTOCORRELATIONS

  1- 12    -.06 -.10  .13  .04  .09  .19 -.08 -.03  .17 -.06  .09  .13
  ST.E.     .12  .12  .12  .12  .12  .12  .12  .12  .12  .13  .13  .13

 13- 20     .05  .04  .01 -.07  .03  .11  .01  .06
  ST.E.     .13  .13  .13  .13  .13  .13  .13  .13

PLOT OF SERIAL CORRELATION

             -1.0  -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                         I
  1   -.060                         +   XI     +
  2   -.103                         + XXXI     +
  3    .131                         +    IXXX  +
  4    .041                         +    IX    +
  5    .089                         +    IXX   +
  6    .191                         +    IXXXXX+
  7   -.076                         +  XXI     +
  8   -.031                         +   XI     +
  9    .170                         +    IXXXX +
 10   -.061                         +  XXI     +
 11    .095                         +    IXX   +
 12    .128                         +    IXXX  +
 13    .048                         +    IX    +
 14    .042                         +    IX    +
 15    .016                         +    I     +
 16   -.070                         +  XXI     +
 17    .034                         +    IX    +
 18    .114                         +    IXXX  +
 19    .015                        +     I      +
 20    .065                        +     IXX    +


PACF         VAR
```

```
PACF           VARIABLE IS RYX.  MAXLAG IS 20./

NUMBER OF OBSERVATIONS              =          75
MEAN OF THE (DIFFERENCED) SERIES    =     -9.4003
STANDARD ERROR OF THE MEAN          =     70.2040
T-VALUE OF MEAN (AGAINST ZERO)      =      -.1352

PARTIAL AUTOCORRELATIONS

  1- 12      -.06 -.11  .12  .06  .12  .21 -.04 -.03  .10 -.08  .00  .00
 ST.E.        .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .12  .12

 13- 20       .12  .06 -.04 -.09 -.07  .03  .05  .10
 ST.E.        .12  .12  .12  .12  .12  .12  .12  .12

PLOT OF SERIAL CORRELATION

               -1.0  -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG    CORR     +----+----+----+----+----+----+----+----+----+----+
                                          I
  1    -.060                        +    XI    +
  2    -.107                        +  XXXI    +
  3     .110                        +     IXXX +
  4     .046                        +     IX   +
  5     .123                        +     IXXX +
  6     .207                        +     IXXXXX+
  7    -.030                        +    XI    +
  8    -.020                        +    XI    +
  9     .102                        +     IXXX +
 10    -.075                        +   XXI    +
 11     .094                        +     IXX  +
 12     .097                        +     IXX  +
 13     .119                        +     IXXX +
 14     .052                        +     IX   +
 15    -.030                        +    XI    +
 16    -.090                        +   XXI    +
 17    -.067                        +   XXI    +
 18     .031                        +     IX   +
 19     .051                        +     IX   +
 20     .097                        +     IXX  +
```

```
ARIMA          VARIABLE IS PRIME.
               DFORDER IS 1.
               ARORDERS ARE '(14)'.
               ARVALUES = .3007.
               MAORDERS ARE '(1,3,4)'.
               MAVALUES = -.0665, .3517, .5606.
               CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = PRIME
INPUT  VARIABLE = NOISE


 FORECAST      CASES = 24.  JOIN./


 FORECAST ON VARIABLE PRIME     FROM TIME PERIOD    82
```

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	17.17000	.83725	
83	17.56023	1.62003	
84	17.85367	2.13260	
85	17.85082	2.30613	
86	17.73272	2.47686	
87	17.24250	2.56466	
88	16.75846	2.63034	
89	16.43060	2.70300	
90	16.43060	2.77552	
91	16.57426	2.84533	
92	16.65622	2.91340	
93	16.65622	2.98086	
94	16.65622	3.04519	
95	16.65622	3.10695	
96	16.66066	3.23061	
97	16.87774	3.30404	
98	17.00313	3.55160	
99	17.06407	3.67782	
100	17.02000	3.76700	
101	16.87051	3.85411	
102	16.73304	3.93540	
103	16.63630	4.02268	
104	16.63530	4.10437	
105	16.78062	4.18447	

```
STANDARD ERROR =  .837260      (BY CONDITIONAL METHOD  )


 PSIWEIGHT
```

```
PSIWEIGHT    MAXPSI = 40./

40 PSI-WEIGHTS ARE STORED


ERASE        MODEL./

UNIVARIATE TIME SERIES MODEL ERASED


ARIMA        VARIABLE IS ACC13AM.
             ARORDRES ARE '(1,8)'.
             ARVALUES = .7581, .1048.
             CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE


INDEP        VARIABLE IS PRIME./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE    PRIME


FORECAST     CASES = 40.  JOIN./
```

FORECAST ON VARIABLE ACCIBAM FROM TIME PERIOD 82

PERIOD	FORECASTS	ST. ERR	ACTUAL
82	4873.81241	612.01505	
83	4366.71082	786.10242	
84	4167.20600	840.21024	
85	3999.77820	870.13400	
86	3827.93216	889.20004	
87	3787.72080	911.08100	
88	3713.30706	920.32177	
89	3624.10062	945.20005	
90	3537.70875	958.41026	
91	3452.52128	972.70915	
92	3373.46811	982.26270	
93	3310.06340	990.25000	
94	3254.75546	994.95043	
95	3203.95124	999.00381	
96	3157.01254	1003.00182	
97	3112.70048	1007.57608	
98	3071.20021	1010.50032	
99	3033.54026	1013.06498	
100	2999.36060	1015.09073	
101	2968.27371	1016.78307	
102	2930.07070	1018.10057	
103	2914.11035	1019.36074	
104	2898.44324	1020.35808	
105	2868.70651	1021.10752	

BASED ON THE AVAILABLE DATA, ONLY 24 FORECASTS CAN BE MADE

STANDARD ERROR = 612.015 (BY CONDITIONAL METHOD)

-END OF INFORMATION-
?

```
ARIMA        VARIABLE IS PRIME.
             DFORDER IS 1.
             ARORDERS ARE '(1,2,4,5,6,10)'.
             CENTERED./
ESTIMATION   RESIDUAL = RX.  MAXIT = 10./
```

ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN .1000E-04

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- PRIME
INPUT VARIABLES -- NOISE

VARIABLE	VAR. TYPE	MEAN	TIME	DIFFERENCES
PRIME	RANDOM	REMOVED	1- 81	$(1-B^{1})$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	PRIME	AR	1	1	.6760	.1083	6.24
2	PRIME	AR	1	2	-.3686	.1081	-3.41
3	PRIME	AR	1	4	-.3758	.1153	-3.26
4	PRIME	AR	1	5	.3720	.1317	2.83
5	PRIME	AR	1	6	-.4602	.1180	-3.90
6	PRIME	AR	1	10	-.2573	.1027	-2.51

```
RESIDUAL SUM OF SQUARES  =     44.478598
DEGREES OF FREEDOM       =            64
RESIDUAL MEAN SQUARE     =       .694978
```

ESTIMATION BY BACKCASTING METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN .1000E-04

SUMMARY OF THE MODEL

OUTPUT VARIABLE -- PRIME
INPUT VARIABLES -- NOISE

VARIABLE	VAR. TYPE	MEAN	TIME	DIFFERENCES
PRIME	RANDOM	REMOVED	1- 81	$(1-B^{1})$

PARAMETER	VARIABLE	TYPE	FACTOR	ORDER	ESTIMATE	ST. ERR.	T-RATIO
1	PRIME	AR	1	1	.6738	.1078	6.25
2	PRIME	AR	1	2	-.3650	.1076	-3.40
3	PRIME	AR	1	4	-.3733	.1147	-3.26
4	PRIME	AR	1	5	.3723	.1313	2.84
5	PRIME	AR	1	6	-.4638	.1187	-3.90
6	PRIME	AR	1	10	-.2548	.1018	-2.50

```
RESIDUAL SUM OF SQUARES  =     44.481786 (BACKCASTS EXCLUDED)
DEGREES OF FREEDOM       =            64
RESIDUAL MEAN SQUARE     =       .695028
```

```
 FILTER       VARIABLE IS ACCI3AM.
              RESIDUALS = RY./


RESIDUAL MEAN SQUARE     =   1047700.000466

VARIABLE ACCI3AM  IS FILTERED. RESULTS ARE STORED IN VARIABLE RY


 ACF          VARIABLE IS RY.  MAXLAG IS 20./

NUMBER OF OBSERVATIONS            =           81
MEAN OF THE (DIFFERENCED) SERIES  =     -35.6400
STANDARD ERROR OF THE MEAN        =     108.1230
T-VALUE OF MEAN (AGAINST ZERO)    =       -.3207

AUTOCORRELATIONS

 1- 12    -.58  .15 -.07  .31 -.33  .24  .01 -.02 -.03  .01  .13 -.04
 ST.E.     .11  .14  .15  .15  .15  .16  .17  .17  .17  .17  .17  .17

13- 20    -.11  .17 -.03 -.02 -.05  .17 -.11  .07
 ST.E.     .17  .17  .17  .17  .17  .17  .17  .17

PLOT OF SERIAL CORRELATION

             -1.0  -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                        I
  1   -.584            XXXXXXXXXX+XXXXI    +
  2    .153                   +     IXXXX  +
  3   -.073                   +   XXI      +
  4    .300                   +     IXXXXXX+X
  5   -.331                 XXXXXXXXI       +
  6    .236                  +      IXXXXXX +
  7    .013                  +      I       +
  8   -.024                  +     XI       +
  9   -.026                  +     XI       +
 10    .005                  +      I       +
 11    .131                  +      IXXX    +
 12   -.036                  +     XI       +
 13   -.114                  +   XXXI       +
 14    .174                  +      IXXXX   +
 15   -.032                  +     XI       +
 16   -.024                  +     XI       +
 17   -.061                  +     XI       +
 18    .180                  +      IXXXX   +
 19   -.187                 +    XXXI        +
 20    .065                 +       IXX      +
```

```
PACF          VARIABLE IS RY.  MAXLAG IS 20./

NUMBER OF OBSERVATIONS              =          81
MEAN OF THE (DIFFERENCED) SERIES    =    -35.6400
STANDARD ERROR OF THE MEAN          =    108.1230
T-VALUE OF MEAN (AGAINST ZERO)      =      -.3297

PARTIAL AUTOCORRELATIONS

  1- 12     -.58 -.20 -.21  .34  .13  .17  .30  .18  .14 -.10 -.07  .14
 ST.E.       .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11

 13- 20     -.15  .04  .02  .00 -.01 -.11  .06  .14
 ST.E.       .11  .11  .11  .11  .11  .11  .11  .11

PLOT OF SERIAL CORRELATION

               -1.0  -.8  -.6  -.4  -.2   .0   .2   4   .6   .8  1.0
LAG    CORR.    +----+----+----+----+----+----+----+----+----+----+
                                          I
  1   -.584               XXXXXXXXXXX+XXXXI    +
  2   -.286                         XX+XXXXI    +
  3   -.287                           XXXXXI    +
  4    .348                          +    IXXXX+XXX
  5    .125                          +    IXXX +
  6    .160                          +    IXXXX+
  7    .200                          +    IXXXX+XX
  8    .160                          +    IXXXX+
  9    .135                          +    IXXX +
 10   -.191                          XXXXXI    +
 11   -.072                          +   XXI    +
 12    .130                          +    IXXX +
 13   -.146                          +XXXXI    +
 14    .030                          +    IX   +
 15    .023                          +    IX   +
 16    .003                          +    IXX  +
 17   -.012                          +    I    +
 18   -.111                          + XXXI    +
 19    .052                          +    IX   +
 20    .141                          +    IXXXX+

CCF
```

```
CCF          VARIABLES ARE RX,RY   MAXLAG IS 20./

EFFECTIVE NUMBER OF OBSERVATIONS =   81

CORRELATION          OF RX           AND RY          IS      .02

CROSS CORRELATIONS OF RX        (I) AND RY         (I+K)

  1- 12      .01  .07 -.02  .06 -.03  .11 -.07  .00  .02  .05  .01  .05
  ST.E.      .11  .11  .11  .11  .11  .12  .12  .12  .12  .12  .12  .12

 13- 20     -.01  .04  .10  0.0 -.05  .00 -.06  .06
  ST.E.      .12  .12  .12  .12  .13  .13  .13  .13

CROSS CORRELATIONS OF RY        (I) AND RX         (I+K)

  1- 12     -.02  .06 -.01  .03  .02  .05 -.01  .04 -.01  .03  .11 -.07
  ST.E.      .11  .11  .11  .11  .11  .12  .12  .12  .12  .12  .12  .12

 13- 20     -.03  0.0  .08 -.05  .01 -.04  .00 -.12
  ST.E.      .12  .12  .12  .12  .13  .13  .13  .13

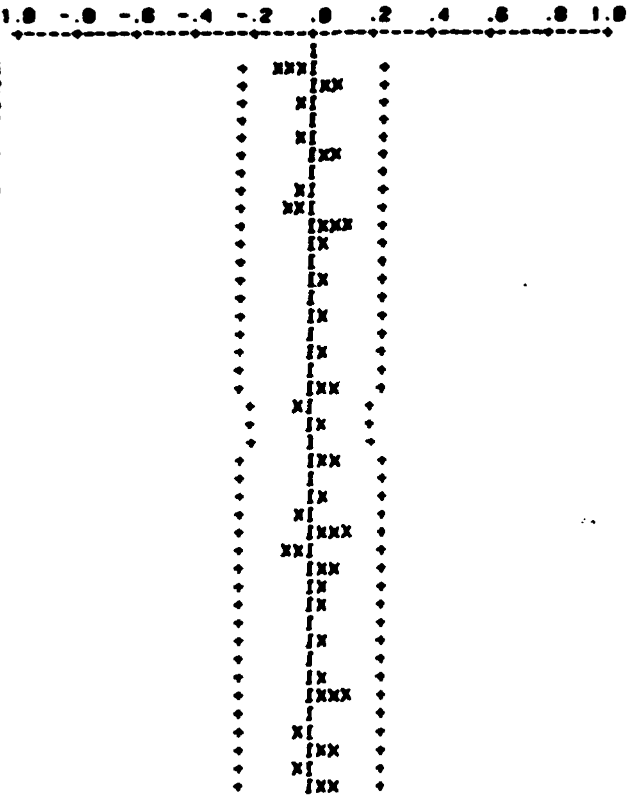
TRANSFER FUNCTION WEIGHTS

         SCCF(X(I),Y(I+K))          SCCF(Y(I),X(I+K))
  LAG     *SY/SX      *SX/SY         *SY/SX      *SX/SY

   0    30.72327      .00002     30.72327      .00002
   1    12.10766      .00001    -27.21207     -.00002
   2    86.94015      .00005     80.20067      .00006
   3   -20.25463     -.00001    -11.06203     -.00001
   4    77.06820      .00004     41.14006      .00002
   5   -36.60500     -.00002     23.00063      .00001
   6   147.12700      .00008     37.50752      .00002
   7   -80.07430     -.00005    -10.40072     -.00001
   8   104.31060      .00006     52.35145      .00003
   9    31.60070      .00002    -15.12006     -.00001
  10    86.42547      .00004     35.46470      .00002
  11    10.71800      .00001    145.05507      .00008
  12    60.00005      .00004    -88.06175     -.00005
  13   -13.00101     -.00001    -30.71120     -.00002
  14    54.03377      .00003      1.07153      .00000
  15   137.42030      .00008    104.13004      .00006
  16     2.13016      .00000    -62.22031     -.00004
  17   -63.20621     -.00004     16.40467      .00001
  18   118.70007      .00007    -50.50206     -.00003
  19   -73.04519     -.00004    100.20407      .00006
  20    82.14572      .00005   -105.46050     -.00006

  WHERE X(I) IS THE FIRST SERIES, Y(I) THE SECOND
  SERIES, SX THE STANDARD ERROR OF X(I), AND SY
  THE STANDARD ERROR OF Y(I)
```

PLOT OF SERIAL CORRELATION



LAG	CORR.
-20	-.126
-19	.082
-18	-.046
-17	.012
-16	-.047
-15	.070
-14	.001
-13	-.030
-12	-.067
-11	.110
-10	.027
-9	-.011
-8	.030
-7	-.014
-6	.020
-5	.018
-4	.031
-3	-.009
-2	.060
-1	-.028
0	.023
1	.000
2	.065
3	-.015
4	.050
5	-.028
6	.111
7	-.066
8	.079
9	.024
10	.050
11	.008
12	.053
13	-.018
14	.041
15	.104
16	.002
17	-.048
18	.060
19	-.055
20	.062

ARI

```
ARIMA      VARIABLE IS ACC13AM.                              ACF      VARIABLE IS RYX.
           ARORDERS ARE '(1)'.
           ARVALUES = .7177.
           MAORDERS ARE '(6)'.
           MAVALUES = -.3465.
           CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE


 INDEP     VARIABLE IS PRIME./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACC13AM
INPUT  VARIABLE = NOISE    PRIME


 ESTIMATION   RESIDUALS IS RYX.  MAXIT = 10.
              METHOD IS CLS./


ESTIMATION BY CONDITIONAL LEAST SQUARES METHOD

RELATIVE CHANGE IN RESIDUAL SUM OF SQUARES LESS THAN  .1000E-04


SUMMARY OF THE MODEL

OUTPUT VARIABLE -- ACC13AM
INPUT VARIABLES -- NOISE    PRIME

VARIABLE  VAR. TYPE  MEAN      TIME     DIFFERENCES

ACC13AM    RANDOM    REMOVED  1-  81

PRIME      RANDOM             1-  81

PARAMETER VARIABLE   TYPE  FACTOR  ORDER ESTIMATE    ST. ERR.  T-RATIO
      1  ACC13AM      MA      1      6     -.3459      .1135    -3.05
      2  ACC13AM      AR      1      1      .7118      .0802    10.43

RESIDUAL SUM OF SQUARES  =  28660502.710625
DEGREES OF FREEDOM       =               78
RESIDUAL MEAN SQUARE     =    367443.496200
```

```
 ACF          VARIABLE IS RYX.  MAXLAG IS 20./

NUMBER OF OBSERVATIONS               =          80
MEAN OF THE (DIFFERENCED) SERIES =         -6.8734
STANDARD ERROR OF THE MEAN           =         67.3373
T-VALUE OF MEAN (AGAINST ZERO)       =          -.1021

AUTOCORRELATIONS

  1- 12     -.02 -.07  .08  .11  .16 -.02  .04  .04  .15  0.0  .16  .01
 ST.E.       .11  .11  .11  .11  .11  .12  .12  .12  .12  .12  .12  .12

 13- 20     -.07  .13 -.02 -.06  .02  .13  .01 -.02
 ST.E.       .12  .12  .13  .13  .13  .13  .13  .13

PLOT OF SERIAL CORRELATION

             -1.0  -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG   CORR.  +----+----+----+----+----+----+----+----+----+----+
                                        I
  1   -.024                         +  XI    +
  2   -.072                         + XXI    +
  3    .080                        +    IXX   +
  4    .107                        +    IXXX  +
  5    .159                        +    IXXXX +
  6   -.017                        +    I     +
  7    .043                        +    IX    +
  8    .042                        +    IX    +
  9    .152                        +    IXXXX +
 10    .002                        +    I     +
 11    163                         +    IXXXX +
 12    .007                        +    I     +
 13   -.066                        + XXI      +
 14    .132                        +    IXXX  +
 15   -.017                        +    I     +
 16   -.056                        + XXI      +
 17    .025                        +    IX    +
 18    .131                        +    IXXX  +
 19    .011                        +    I     +
 20   -.010                        +    I     +
```

```
PACF          VARIABLE IS RYX.  MAXLAG IS 20./

NUMBER OF OBSERVATIONS                =          80
MEAN OF THE (DIFFERENCED) SERIES      =     -6.8734
STANDARD ERROR OF THE MEAN            =     67.3373
T-VALUE OF MEAN (AGAINST ZERO)        =      -.1021

PARTIAL AUTOCORRELATIONS

  1- 12    -.02 -.07  .00  .11  .10  0.0  .06  0.0  .13 -.02  .10 -.03
 ST.E.      .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11  .11

 13- 20    -.07  .06 -.06 -.14  .01  .10  .01 -.01
 ST.E       .11  .11  .11  .11  .11  .11  .11  .11

PLOT OF SERIAL CORRELATION

              -1.0  -.8  -.6  -.4  -.2   .0   .2   .4   .6   .8  1.0
LAG    CORR.  +----+----+----+----+----+----+----+----+----+----+
                                         I
  1    -.024                        +   XI    +
  2    -.072                        +  XXI    +
  3     .086                        +    IXX  +
  4     .107                        +    IXXX +
  5     .161                        +    IXXXXX
  6     .003                        +    I    +
  7     .068                        +    IX   +
  8     .001                        +    I    +
  9     .133                        +    IXXX +
 10    -.019                        +    I    +
 11     .188                        +    IXXXXX
 12    -.038                        +   XI    +
 13    -.070                        +  XXI    +
 14     .046                        +    IX   +
 15    -.052                        +   XI    +
 16    -.143                        +XXXXI    +
 17     .015                        +    I    +
 18     .080                        +    IXX  +
 19     .000                        +    I    +
 20    -.012                        +    I    +
```

```
. ARIMA        VARIABLE IS PRIME.
               SFORDER IS 1.
               ARORDERS ARE '(1,2,4,5,6,10)'
               ARVALUES = .8738, -.3860, -.3733, .3728, -.483, -.284.
               CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = PRIME
INPUT  VARIABLE = NOISE


 FORECAST      CASES = 24.  JOIN./


 FORECAST ON VARIABLE PRIME    FROM TIME PERIOD    82
```

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	16.93864	.83368	
83	17.23746	1.62540	
84	17.72334	2.10804	
85	18.21532	2.55400	
86	18.20820	2.68805	
87	17.86357	2.70473	
88	17.38258	2.85660	
89	17.03080	2.88138	
90	16.94566	2.88316	
91	16.88502	2.92778	
92	16.85860	2.95433	
93	16.87106	2.97400	
94	16.98490	2.98853	
95	16.93503	3.01278	
96	16.99280	3.07877	
97	17.10338	3.16128	
98	17.20363	3.28405	
99	17.46306	3.36378	
100	17.50648	3.45348	
101	17.44048	3.53808	
102	17.35802	3.58702	
103	17.28042	3.63138	
104	17.18256	3.67114	
105	17.11842	3.71816	

```
STANDARD ERROR =  .833683     (BY CONDITIONAL METHOD )


 PSIWEIGHT    MAXPS
```

```
PSIWEIGHT    MAXPSI = 40./

40 PSI-WEIGHTS ARE STORED


ERASE        MODEL./

UNIVARIATE TIME SERIES MODEL ERASED


ARIMA        VARIABLE IS ACCISAM.
             ARORDERS ARE '(1)'.
             ARVALUES = .7117.
             MAORDERS ARE '(6)'.
             MAVALUES = -.3465.
             CENTERED./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACCISAM
INPUT  VARIABLE = NOISE


INDEP        VARIABLE IS PRIME./

THE COMPONENT HAS BEEN ADDED TO THE MODEL

THE CURRENT MODEL HAS
OUTPUT VARIABLE = ACCISAM
INPUT  VARIABLE = NOISE     PRIME


FORECAST     CASES = 40.  JOIN./
```

FORECAST ON VARIABLE ACCIBAM FROM TIME PERIOD 82

PERIOD	FORECASTS	ST. ERR.	ACTUAL
82	4718.77364	886.17172	
83	4321.00000	744.01760	
84	4175.82364	804.00222	
85	3751.84044	834.01852	
86	3502.17222	840.30470	
87	3000.66100	855.00454	
88	3371.30705	882.02101	
89	3180.00061	825.02032	
90	3000.21515	837.20753	
91	2882.15822	843.00020	
92	2826.84342	845.00202	
93	2771.74005	847.30500	
94	2733.28365	848.10567	
95	2706.77770	848.40836	
96	2686.20300	848.57023	
97	2672.40085	848.70657	
98	2662.70025	848.81555	
99	2655.81440	848.84852	
100	2650.84440	848.85331	
101	2647.31034	848.85080	
102	2644.80148	848.86338	
103	2642.78162	848.86587	
104	2641.41051	848.86684	
105	2640.43706	848.86860	

BASED ON THE AVAILABLE DATA, ONLY 24 FORECASTS CAN BE MADE

STANDARD ERROR = 886.171 (BY CONDITIONAL METHOD)

END/

Appendex E-9

Forecasts of TS Models

```
ARIMA        VARIABLE IS ACC13AM.
             DFORDER IS 1.
             ARORDERS ARE '(1,2)'.
             CENTERED./

FORECAST     CASE IS 10.  START IS 50./
```

FORECAST ON VARIABLE ACC13AM FROM TIME PERIOD 50

PERIOD	FORECASTS	ST. ERR.	ACTUAL
50	1748.97683	713.64942	1742.00000
51	1678.35866	880.91520	1650.00000
52	1655.71074	943.40842	2488.00000
53	1685.05384	1045.89281	2504.00000
54	1684.34892	1150.15525	2340.00000
55	1674.95158	1229.25173	2203.00000
56	1677.77880	1304.73549	2172.00000
57	1680.06950	1380.47766	2398.00000
58	1678.51230	1450.75478	2915.00000
59	1678.19378	1516.87421	2653.00000

STANDARD ERROR = 713.649 (BY CONDITIONAL METHOD)

```
ARIMA       VARIABLE IS ACC13AM.
            DFORDER IS 1.
            ARORDERS ARE '(1,2)'.
            CENTERED./

FORECAST    CASE IS 10.  START IS 60./
```

FORECAST ON VARIABLE ACC13AM FROM TIME PERIOD 60

PERIOD	FORECASTS	ST. ERR.	ACTUAL
60	2556.39389	661.07372	2375.00000
61	2668.73581	816.01676	2495.00000
62	2669.27230	873.90600	2323.00000
63	2632.39999	968.84021	2500.00000
64	2642.41359	1065.42146	3113.00000
65	2651.69991	1138.69078	3029.00000
66	2645.86041	1208.61353	2965.00000
67	2644.43839	1278.77565	2649.00000
68	2646.74024	1343.87534	2322.00000
69	2646.56902	1405.12365	2998.00000

STANDARD ERROR = 661.074 (BY CONDITIONAL METHOD)

```
ARIMA       VARIABLE IS ACC13AM.
            DFORDER IS 1.
            ARORDERS ARE '(1,2)'.

FORECAST    CASE IS 10.  START IS 75./
```

FORECAST ON VARIABLE ACC13AM FROM TIME PERIOD   75

PERIOD	FORECASTS	ST. ERR.	ACTUAL
75	3194.09557	602.63919	3630.00000
76	3155.86233	743.88630	4455.00000
77	3178.81816	796.65851	4454.00000
78	3184.97302	883.20116	4933.00000
79	3175.76808	971.24528	4396.00000
80	3176.29970	1038.03807	4455.00000
81	3179.16185	1101.78012	5097.00000
82	3178.19716	1165.74037	
83	3177.52811	1225.08568	
84	3178.02834	1280.92005	

STANDARD ERROR = 602.639   (BY CONDITIONAL METHOD)

FORECAST CASE IS 10. START IS 50./

FORECAST ON VARIABLE ACC13AM FROM TIME PERIOD 50

PERIOD	FORECASTS	ST. ERR.	ACTUAL
50	1631.13598	608.05057	1742.00000
51	1624.99382	784.98051	1650.00000
52	1646.37702	867.48427	2488.00000
53	1662.90076	963.67506	2504.00000
54	1854.64815	1059.92722	2340.00000
55	1701.97338	1141.99861	2203.00000
56	1521.88813	1217.76167	2172.00000
57	1653.96637	1290.51636	2398.00000
58	1860.62967	1359.30526	2915.00000
59	1766.05508	1424.47338	2653.00000

STANDARD ERROR = 608.051 (BY CONDITIONAL METHOD)

1PAGE 11 ACCESSIONS

FORECAST CASE IS 10. START IS 60./

FORECAST ON VARIABLE ACC13AM FROM TIME PERIOD 60

PERIOD	FORECASTS	ST. ERR.	ACTUAL
60	2549.33471	549.21368	2375.00000
61	2632.00274	709.02331	2495.00000
62	2512.52297	783.54375	2323.00000
63	2542.93764	870.42681	2500.00000
64	2598.95116	957.36531	3113.00000
65	2556.72016	1031.49521	3029.00000
66	2774.60056	1099.92720	2965.00000
67	2749.14360	1165.64191	2649.00000
68	2657.10415	1227.77459	2322.00000
69	2643.60233	1286.63683	2998.00000

```
ARIMA        VARIABLE IS ACC13AM.
             DFORDER IS 1.
             ARORDERS ARE '(1,2,14)'.
             CENTERED./

FORECAST     CASE IS 10.  START IS 75./
```

FORECAST ON VARIABLE ACC13AM FROM TIME PERIOD 75

PERIOD	FORECASTS	ST. ERR.	ACTUAL
75	3239.12204	496.13972	3630.00000
76	3155.69930	640.50595	4455.00000
77	3216.53659	707.82501	4454.00000
78	3389.29928	786.31202	4933.00000
79	3320.38748	864.84911	4396.00000
80	3273.98160	931.81537	4455.00000
81	3244.86950	993.63435	5097.00000
82	3149.68556	1052.99864	
83	3356.49160	1109.12704	
84	3470.80177	1162.30106	

STANDARD ERROR = 496.140 (BY CONDITIONAL METHOD)

1PAGE 9 ACCESSIONS

```
ARIMA       VARIABLE IS ACC13AM.
            DFORDER IS 1.
            ARORDERS ARE '(1,2,14)'.
            CENTERED./

FORECAST    CASE IS 10.  START IS 80./
```

FORECAST ON VARIABLE ACC13AM FROM TIME PERIOD 80

PERIOD	FORECASTS	ST. ERR.	ACTUAL
80	4361.11308	502.22676	4455.00000
81	4413.59049	648.36419	5097.00000
82	4325.12868	716.50918	
83	4509.10059	795.95913	
84	4633.25590	875.45978	
85	4461.12185	943.24763	
86	4456.14689	1005.82505	
87	4496.20323	1065.91768	
88	4529.84149	1122.73471	
89	4620.19912	1176.56110	

STANDARD ERROR = 502.227 (BY CONDITIONAL METHOD)

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VITA

Kenneth Michael Kalinich was born on 30 November 1951 in Endicott, New York. He enlisted in the Army in July 1969 to attend the United States Military Academy Preparatory School at Ft. Belvoir, Virginia. He attended and graduated from the United States Military Academy in 1974 with a Bachelor of Science degree. He was commissioned in June 1974 and was stationed at Ft. Eustis, Virginia where he served as personnel management officer for the post. In September 1977 he was assigned to Headquarters V US Army Corps in Germany where he performed duties as company grade (officer) assignment officer. From there he was assigned to Fulda, Germany where he served as Regional Personnel Center Commander. In August 1979 he was assigned to Frankfurt, Germany where he served as Detachment Commander for the 64th Replacement Regulating Detachment. In September 1980 he attended the Adjutant General Officer Advanced Course at Ft. Harrison, Indiana, and was subsequently assigned for duty at the School of Engineering, Air Force Institute of Technology, in May 1981.

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Dennis Charles Wenzel was born on 1 August 1949 in San Antonio, Texas. He enlisted in the Army in February 1972 and served in Korea as a computer programmer from September 1972 to October 1974. Under an Army enlisted student status, he received a Bachelor of Arts in Mathematics and a Bachelor of Business Administration in Personnel Management from Saint Mary's University of San Antonio in May 1976. He was commissioned in October 1976 and served in Korea for one year as a computer data base manager. In January 1978 he performed duty as a personnel management officer in the 6th Air Cavalry Brigade and as a systems analyst in III Corps at Fort Hood, Texas. In 1980 he was assigned six months Temporary Duty to Fort Harrison, Indiana, as a Data Processing Officer Student and Instructor. He then attended the Adjutant General Officer Advanced Course at Fort Harrison, and was subsequently assigned for duty at the School of Engineering, Air Force Institute of Technology, in May 1981.

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